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WOUNDS OF THE HEAD AND COMPENSATION LAWS*

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NEW YORK

INJURIES AND COMPENSATION

There are now forty-two states and two territories in this country that have compensation laws. It is estimated, approximately, that two and a half million accidents occur yearly to workmen (four-fifths being trivial) and that $120,000,000 are spent on them. In spite of all preventive efforts the number of accidents is said not to be decreasing.

There are about 2,500,000 workmen in New York state subject to the compensation laws (about 80 per cent. of all workmen). There were 288,441 accidents reported in 1919. About 20 per cent., or 57,550 were compensated, and the total compensation in 1916 was $12,803,000, about $12,000,000 being in cash benefits and about $180,000 for medical services. In New York, if a workman is injured enough to lay off for two weeks, he receives compensation, namely, medical attention and $20 per week for two months. If at the end of two months he is not well, he goes to the State Industrial Commission, which decides whether his injury is a total or partial, complete or temporary disability: (1) permanent, partial and (2) temporary total disability, are the two main groups, for which compensation is given.

Large numbers of applicants for further relief appear at the commission office, about two months after the accident. They have meanwhile been under the care of insurance and other physicians, but are still disabled—or think they are.

About 15 per cent. of these applicants complain of nervous symptoms and a great many of them have received wounds of the head or have fallen. These accidents have been followed by symptoms of brain concussion, brain contusion, fracture of the skull, and other

*Read at the Forty-Sixth Annual Meeting of the American Neurological Association, New York, June, 1920.

conditions. These patients are referred to various neurologists and their stories are no doubt familiar. Dr. Michael Osnato has made a study and analysis of 200 such cases, and has given statistics of the age, social condition and symptomatology, classifying them in two groups—(1) traumatic neuroses, (2) traumatic hysterias.

The frequency of wounds of the head which are not fatal and which do not cause definite crushing or hemorrhage of the brain is great, but there is yet no satisfactory explanation of the symptoms or sure information about the prognosis. A study of the natural history of these wounds should be made. I have seen and examined many cases of this kind in the last few years, and have gone over a number of my earlier cases of traumatisms of the head in which litigation was sometimes involved and sometimes not.

I am not analyzing these cases, since Dr. Osnato has done it carefully and well. My study has been made rather to inquire into the nature of the injury and what can best be done for these cases by the profession and the state.

It seems to be the opinion that the present compensation laws are doing good on the whole, but are imperfect and in many states ineffective. In so far as they relate to the treatment of wounds of the head, I think that improvements are needed and can be made and I think that those officially connected with compensation work have an open mind on the subject.

HEAD WOUND SYNDROME

The syndrome itself of nonfatal, nondestructive wounds of the head is quite a definite one. From whatever source gathered the story is about the same. In Dr. Bailey's book on injuries of the nervous system, in a description of traumatic neurosis published years ago by myself, (Hamilton's Legal Medicine), in Chatelin and Demartel's "Wounds of the Skull and Brain," the lists of subjective symptoms given have about the same items.

The patients from the compensation commission who come with bruised heads tell stories so startlingly similar that it seemed to me finally that there must be an underground school for the education of those who have been hit on the head and desire permanent total disability compensation.

This syndrome of wounds of the head as described by Bailey[1] is: headache, vertigo, irritability, sleep disturbances, asthenia and memory defect.

1. Bailey: Injuries, p. 141.

The symptom group given by Chatelin and Demartel,[2] and "found in cases with and without sign of objective trouble" is: headache, vertigo, insomnia, changes in character, memory defects, vasomotor phenomena, sweats, palpitations and flushings. My own records of compensation cases give about the same list: headache, vertigo, insomnia, irritability, anxiety, depression, memory defects, fatigability, tinnitus, partial deafness and loss of weight. Thus the wound of the head syndrome is a well established one. It follows wounds of the head in war time, in civil life with litigation and compensation and without either. It is a picture of a general traumatic neurosis or psychoneurosis with certain local head symptoms, which have a possible legitimate basis.

NATURE OF SYMPTOMS

The experience of surgeons shows that when the brain has been badly contused and the skull injured, headache and attacks of something like vertigo or mental confusion occur. In bad wounds and contusions the headache is intense at times and even calls for surgical relief.

It is probable that in all severe direct blows on the head there is some contusion of the brain, but in most cases it is trifling and it is generally stated that the wound of the head syndrome disappears in a few months.

I classify the patients as follows:

1. In about 10 per cent. of compensation cases with head wounds the patient has the main features of this syndrome and is just made uncomfortable by it. One cannot say he has any neurosis or psychosis in the sense that there is any general constitutional disturbance of the nervous centers.

2. In a larger percentage, that is, in more than half the cases, in addition to headache, vertigo and insomnia, the patient is anxious, worried, nervous and depressed and cannot concentrate or work. He has never been ill or injured before. He doesn't understand why he is not cured by the doctor or the insurance companies and he asserts that he wants to feel well and get back to work. He becomes selfcentered, exaggerates, refuses to attempt to work or to do anything but wait and get some new treatment that will make him well.

3 and 4. In another large percentage of patients, contributed largely from certain races, from the beginning or after an incubation and the sympathetic suggestions of friends, the patients develop a definite attitude of exaggeration or become plain malingerers. They see ahead

2. Chatelin and Demartel: Wounds of the Head, p. 38.

a lump sum of several hundred dollars. Various neurotic and hysterical symptoms develop in connection with these attitudes of mind.

There are some definite facts about these cases:

1. The patients have been distinctly and seriously injured, in most cases knocked unconscious for periods varying from a few minutes to a few days.

2. They have developed a definite and, we may say, normal syndrome of head wounds.

3. They have no specific evidence of any localized brain injury—no evidence of any central organic nervous disease, except that we may suppose there has been some slight brain bruise or local meningeal reaction or a labyrinthine injury.

4. They are receiving weekly compensation and many expect to be pronounced more or less disabled and receive some lump sum which is rarely more than a few hundred dollars.

5. When their case is settled, the symptoms do not always disappear; and, after their final award is spent, in some cases they come back with the same or more symptoms, and try to get more money.

6. In similar wounds of the head in nonlitigated cases the symptoms sometimes continue and may even grow worse.

I think every one has had cases of these kinds under observation. How are we to explain the symptoms? It is not enough to classify them into traumatic neuroses and traumatic psychoneuroses in accordance with the amount of neurotic or psychic element in the cases. I place them in the four categories just referred to.

The psychology is, in most cases, simple and does not involve the subconscious very much. Indeed most of the patients are dull, extremely ignorant, and do not appear to have any organized subconsciousness, much less a directing complex or the mechanisms of a subconscious defense. They are uncomfortable, suffering, apprehensive, hopeful of getting a sum of money, or they are perhaps enjoying life without work for the first time and receiving money weekly like the idle rich, while the wife works harder at home or goes out and earns more money. They are, in fine, under the various conscious drives of the instinct for food and an easy life, the instinct for native home, the fear of death and disability, the fear of the future and uncertainty of settlement. In many cases we may suppose that on the basis of the brain concussion injury together with the emotional reaction associated with it and an expectation of relief and reward, disassociations occur, the synapses break down and so-called hysterical symptoms appear. Then they are said to have a traumatic psychoneurosis.

My feelings toward most of the patients, however, is that to call them victims of neuroses or psychoses is hardly worthy of our science.

They have just traumatic conduct disorders. They suffer hardly even from conduct disorders, but from what are of the nature of antisocial reactions to a painful and incapacitating injury.

Aside from or with the subjective symptoms which I have described there occurs a percentage of real injuries, such as fracture of the bones, severe strains of the neck and back muscles or a definite bruise of Broca's convolution with aphasia. A progressive muscular atrophy appeared in one case. In elderly persons, over 50 or 60 years of age, a cerebral and general arterial sclerosis is found and senility seems to be accelerated.

Morbid fears which are associated with vertigo naturally develop. A man who has been working on high buildings, a painter who has to climb ladders, does not want to go back to his calling and unless he is quite young he probably never can do so. But these are physiologic fears, at least they do not necessarily involve any complexes or subconscious defense reactions. A good many patients develop "habit pains" which may be explained as "conditional reflexes."

TREATMENT

Most cases could be relieved early and entirely if properly handled; this is the important issue I would emphasize.

If after an injury the state refused all compensation, all final awards for disability, probably there would be 50 per cent. less who would continue to have the wound of the head syndrome; but there would still be many left. The state cannot now undertake this change, but it could do something. Now it spends $12,000,000 on compensation and $180,000 on medical care. It should spend its money on the immediate and skilful care of the injured man. He should be early diagnosticated, instructed and intensively treated and reconstructed, and he should be emphatically told that his functional troubles will receive no recognition as permanent disability.

CONCLUSIONS

My conclusions are that there should be such a modification of compensation laws, that the patient receive early expert advice, not only surgical but neurologic; that treatment and reeducational and reconstructive measures be early and actively employed; that the closest possible study be made early to determine the existence of local brain and cord injuries. Perhaps some day objective tests may be discovered that will detect exaggeration and malingering.

Until then we must rely on experience and acuteness of observations and on the intensively detailed history of the case.

CHOREO-ATHETOID AND CHOREOPSYCHOTIC SYNDROMES AS CLINICAL TYPES OR SEQUELAE OF EPIDEMIC ENCEPHALITIS*

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Epidemic encephalitis, also known as lethargic encephalitis, nona, infectious ophthalmoplegia and by various other designations, has only recently sprung into prominence but by reason of its rapid spread over the greater part of both hemispheres in less than two years, it has engrossed to an unparalleled degree the attention of scientists throughout the world. Although von Economo's first description of this disease only dates back to the spring of 1917 the amount of literature concerning it has already reached incredible proportions, a fact which has served promptly to vulgarize the symptomatology and diagnostic features of this newly isolated affection and also to provide us with a preliminary knowledge of the character and distribution of the underlying histologic changes.

It seems well established that the lesions involve with especial predilection the tegmentum of the pontopeduncular region and the basal ganglions, and give rise clinically, in the majority of cases, to a fairly distinctive symptomatic picture characterized essentially by fever, progressive lethargy and asthenia, ocular and facial palsies, more or less generalized rigidity or passivity and occasional myoclonic twitchings. The frequent occurrence, however, of quite dissimilar though almost equally typical syndromes affords presumptive evidence that in this disease the histologic changes may be disseminated through the entire nervous system with focal predominance at any given level. It probably will be shown in time that, much in the same fashion as in poliomyelitis, the changes in epidemic encephalitis are generalized in the great majority of cases and that what is now regarded as the classic clinical physiognomy of the disease simply depends on the commonly overwhelming preponderance of the lesions in the periventricular gray matter compassed by the striatothalamotegmental region. This is indeed the favorite localization of the morbid process in epidemic encephalitis and its clinical expression has been so abundantly studied and widely depicted that it can hardly escape detection. It is just as important to recognize the more unusual or atypical forms of the disease, though, be it stated at once, they are atypical only

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by contrast with the more familiar clinical picture sketched in the foregoing. In reality they represent various aberrant or level types in which the salient clinical features are so strikingly foreign to the usual cardinal grouping that diagnosis is frequently jeopardized. Many clinical types of epidemic encephalitis have already been encountered and described and the constant report in the literature of additional syndromes bids fair to extend almost indefinitely the possibility of revised classification of the numerous forms or syndromes to which the remarkably protean symptomatology of the disease may give rise.

Several authors have already hazarded a practical tabulation of the various clinical types of epidemic encephalitis, and to some such a classification at this time may, perhaps, seem somewhat premature, but when one fully realizes the not infrequent difficulties in differential diagnosis which arise in connection with certain forms resembling alcoholic delirium or general paresis, cerebral tumor or cerebral abscess, acute meningitis or poliomyelitis, vascular lesions of the cerebellum, etc., any attempt at early classification will be conceded to be both a judicious and laudable effort. Furthermore, it is no idle task to utilize the valuable and suggestive data furnished by the variable clinical aspects of epidemic encephalitis in a legitimate endeavor to elucidate many obscure problems of cerebral physiology and localization. There can be no doubt that the intensive study, both anatomic and clinical, of this newly identified cerebrospinal affection promises to shed much light on the pathogenesis of several hitherto baffling neurologic disorders such as paralysis agitans, choreiform and athetoid states, endocrinal dysfunctions and even certain psychoses and psychoneuroses.

The various clinical forms of epidemic encephalitis thus far signalized include the following types: lethargic, cataleptic, polioencephalitic, anterior and posterior poliomyelitis, Parkinsonian, acute psychotic, epileptomaniacal, meningitic, meningoradicular, polyneuritic, cerebellar, hemiplegic, diplegic, monoplegic, as well as a form occurring in infants and called for this reason encephalitis neonatorum. In reality there are still other types, and by the time the chapter devoted to this disease has been fully written we probably will find that it embraces clinical syndromes that reproduce with surprising precision the outstanding features of many of the known acute and subacute diseases of the nervous system.

A point which cannot be too strongly emphasized is that aside from a classification based on predominating clinical features and intended to establish the existence of level types, a classification based on the course or evolution of the disease must likewise receive due consideration. Some authors regard the disease as having essentially an acute

onset, while others describe the onset as subacute or insidious. The fact seems to be that both modes of onset are about equally common. The duration of the disease is extremely variable, stated by most observers as being approximately eight weeks in the majority of cases. A hyperacute or fulminating course is extremely rare, yet I have seen two undoubted cases of epidemic encephalitis terminate fatally in less than a week with acute bulbar paralysis. It is becoming more and more evident likewise that a very prolonged or chronic course extending over several months is far from uncommon and this fact is of the greatest importance in explaining the frequent relapses or the recrudescence of certain symptoms observed in patients who, because of the relatively mild and purely evanescent character of their initial disturbances, have been prematurely discharged from hospital service or allowed to resume work. This same factor of chronicity affords an explanation of certain unusual syndromes which soon follow the complete disappearance of a few abortive manifestations of the usual type of the disease and even continue to develop in the pseudoconvalescent stage until a fairly well defined parkinsonian or choreoathetoid syndrome is materialized. Under these circumstances we are apt to interpret such developments as sequelae of the disease, while in reality they are simply the expression of slowly evolving degenerative changes in the cellular complexes of the basal ganglions engendered by a prolonged or even stealthily increasing inadequacy of the vascular supply. Finally, the occurrence of an abortive form of epidemic encephalitis is of the greatest importance and it is more than likely that the number of cases belonging under this head fully equals or even exceeds that of frankly developed cases. Here again the true origin of transitory or substantially recoverable though frequently severe types of psychoneurosis and mental disorder may remain totally unsuspected.

I have seen a total of about sixty cases in which the diagnosis of epidemic encephalitis could be postulated with relative certainty. A factor on which I have relied to a considerable extent is the presence of changes in the cerebrospinal fluid, more particularly a cell count varying from 10 to 200 per cubic millimeter associated with a definitely positive globulin reaction and with otherwise negative findings, i. e., a negative Wassermann reaction and absence of micro-organisms. Many observers have reported series of cases in which the spinal fluid was almost universally negative. Such has not been my experience and in the great majority of cases the fluid was definitely pathologic. I believe that the laboratory findings depend very largely on the stage of the disease and that the conditions are analogous to those encountered in poliomyelitis, namely, the frequent disappearance of

definite changes in the spinal fluid after two or three weeks. Aside from the fact that there are mild or abortive cases with minimum modifications of the spinal fluid, there can be no doubt that many cases of epidemic encephalitis come under proper observation long after the truly initial phase of the disease. This combination of factors may account in part at least for the apparent discrepancies in the report of different clinicians.

Included in the series of sixty cases which have come under my observation were instances which correspond to most of the types thus far described in connection with this disease. Though pains in the extremities and cerebellar manifestations were not particularly uncommon, I have not seen frankly polyneuritic, herpetic or cerebellar types. I have seen, however, eight or nine cases which deserve to be designated as choreopsychotic and choreo-athetoid types of epidemic encephalitis because such manifestations represented in these cases the persistently predominating features of the clinical picture. Inasmuch as these clinical forms do not seem to have attracted much attention, at least so far as one may judge from the relatively meager reference to them in the literature, it has seemed useful to publish a few case histories which serve to illustrate these rather unusual types of epidemic encephalitis. This does not mean, of course, that either choreiform twitchings or psychotic manifestations have not been frequently recorded in connection with the disease. On the contrary, in the very earliest accounts of lethargic encephalitis emanating from Great Britain and France, more particularly in the report of the special British government board [1] and in the initial communications of Netter,[2] the occurrence of choreiform or analogous movements in some cases was emphasized. In this country, Bassoe [3] was apparently the first to note these same phenomena which were present in four of the twelve cases originally reported by him. The choreiform twitchings involved the extremities and in two of the cases were confined to the left leg.

In all of these cases, however, the choreiform jerkings simply represented one of the many striking features in the clinical grouping. The same is true of another hyperkinetic phenomenon more recently identified and consisting of rapid rhythmic myoclonic twitchings in the abdominal wall, the face and the extremities, resembling the shock-like contractions induced by electrical stimulation. This myoclonus,

1. Report on an Inquiry Into an Obscure Disease, Encephalitis Lethargica, Local Government Board Reports on Public Health and Medical Subjects, N. S. 121, London, H. M. Stationery Office.

2. Netter: L'encéphalite léthargiéque, Paris méd. 8:8 (Aug. 3) 1918.

3. Bassoe, Peter: Epidemic Encephalitis (Nona), J. A. M. A. 72:971 (April 5) 1919.

which was described more particularly by Sicard and Kudelski,[4] Sabatini,[5] and Reilly,[6] is quite commonly observed, now that attention has been directed to it, in cases of epidemic encephalitis irrespective of the clinical type under observation. In some instances, however, it constitutes such a predominating feature that Sicard and Kudelski were led to isolate a special form to which they have given the name of "encéphalite aigüe myoclonique." In this type of the disease the myoclonic twitchings are described as brief, rapid and explosive, of distinctly rhythmic character and involving the musculature of the limbs, face and diaphragm; they are preceded by lancinating pains, headache and moderate fever and persist throughout the delirious and stuporous manifestations which eventually develop and usually prove fatal. The ordinary symptoms of epidemic encephalitis, such as somnolence and ocular palsies, are wanting. Sabatini likewise has laid great stress on the frequent occurrence of myoclonic phenomena and has given an excellent description of the symptom which fully tallies with that of the preceding authors. Sabatini insists on the fact that in some cases the jerkings simulated actual chorea. It should be stated, however, that there are very essential differences between chorea and rhythmic myoclonus, and that in reporting the present series of cases I have in mind truly choreiform or choreo-athetoid manifestations and not regular rhythmic spasms.

As regards psychic disturbances in epidemic encephalitis, their common occurrence has been signalized from the very start and many authors have called attention more particularly to the nocturnal agitation with delirious states of hallucinatory or even delusional character. Here again in the majority of cases the psychic disorder has been merely one symptom of an otherwise well characterized instance of the usual type of epidemic encephalitis. In some cases, however, the mental confusion, agitation, hallucinosis, etc., have been so markedly predominant as to quite overshadow all the other features of the disease and to legitimate the description of an "acute psychotic type." Tilney[7] has thus designated this form of the disease. Rather similar observations were published by House[8] and others, and as far as

4. Sicard and Kudelski: L'encéphalite aigüe myoclonique, Bull. de la Soc. méd. d. hôp. **44**:94 (Jan. 23) 1920.

5. Sabatini: Lethargic Encephalitis: Symptoms and Course, Policlinico **27**:97 (Jan. 26) 1920; abstr., J. A. M. A. **74**:1057 (April 10) 1920.

6. Reilly, Thomas F.: Hitherto Undescribed Sign in Diagnosis of Lethargic Encephalitis, J. A. M. A. **74**:735 (Mrach 13) 1920.

7. Tilney: Epidemic Encephalitis, A Preliminary Consideration of Some of Its Prominent Clinical and Pathological Manifestations, Neurol. Bull. **2**:106 (March) 1919.

8. House, W.: Epidemic (Lethargic) Encephalitis, J. A. M. A. **74**:372 (Feb. 7) 1920.

the psychic disturbances are concerned, the cases reported by these authors were remarkably similar to those described in the present article.

The combination of marked and persistent psychic disturbances with incessant choreiform jerkings as the outstanding features of a syndrome produced by epidemic encephalitis appears to be far more uncommon, and typical cases of this sort were not encountered in the literature until very recently when a further contribution to this subject by Bassoe[9] came to my notice. Two of the cases reported by this author somewhat resemble those which have come under my observation and which are herein designated as the choreopsychotic type. This form of the disease is, I believe, far more common than is generally supposed.

Typical choreic and choreo-athetoid or frankly athetoid syndromes and other related spasmodic states occasioned by epidemic encephalitis have been particularly infrequent and have been encountered mainly as tardy or residual developments. Cases belonging under this heading have been reported by Pierre Marie and Mlle. G. Lévy,[10] Souques, Lesne[11] and von Economo.[12] Marie and Lévy published the case histories of seven out of thirteen cases of this kind. In two of the cases the hyperkinetic phenomena were essentially choreic in type, while in four others the movements consisted of rather coarse displacements of great amplitude in the leg or arm, or in both extremities on the same side, accompanied by oblique flexion or extension of the head. These spasmodic manifestations were not rapid and jerky but rather slow and relatively rhythmic and coordinate. The authors feel that they cannot assimilate these disorders to any of the actually recognized categories of involuntary spasmodic phenomena. Lesné's article deals essentially with the development of choreiform movements after the acute stage of lethargic encephalitis or as a sequel of influenza. Personal observations are recorded and the earlier experiences of Netter, Marie and Souques with analogous conditions are summarized. Von Economo has reported an interesting case of lethargic encephalitis remarkable for its chronicity, in which the condition

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9. Bassoe, Peter: The Delirious and the Meningoradicular Types of Epidemic Encephalitis, J. A. M. A. **74**:1009 (April 10) 1920.

10. Marie, Pierre, and Lévy, Mlle. G.: Plusieurs cas de mouvements involontaires d'aspect particulier apparus après un épisode fébrile grippal et, pour certains, après des signes d'encéphalite léthargique, Rev. neurol. **35**:300, 511, 1919.

11. Lesné: Mouvements choréiformes observés à la suite de l'encéphalite léthargique ou de l'influenza, Bull. Soc. méd. d. hôp., Nov. 29, 1918.

12. Von Economo: Encephalitis lethargica chronica, München. med. Wchnschr. **66**:1311 (Nov. 14) 1919.

had an acute onset and exhibited a number of remissions until more serious involvements eventually appeared and proved fatal almost two years after the initial symptoms. The patient gradually developed the syndrome of pseudobulbar paralysis associated with typical athetoid manifestations. It was characterized by dysphagia, dysarthria, dysphonia, paresis of the lingual and palatal musculature, generalized rigidity, spasmodic laughter and choreo-athetoid movements in the face as well as in the upper and lower extremities. The transitory improvement concerned more especially the cranial nerve functions whereas the athetoid disorders steadily increased in severity. At times, however, all the symptoms seemed to recede only to return in more alarming form.

CHOREO-ATHETOID TYPE

CASE 1.—C. W., aged 57, married, a traveling salesman, was seen by me May 5, 1919, about three months after the onset of his disturbances. Reliable data were obtained from his family physician regarding the initial phase of his disease.

History.—His family and personal history yielded nothing of significance for the interpretation of his actual nervous disorder. Both the patient and his physician were quite sure that he had not had influenza and that the first episode in his illness was the appearance of a large and annoying carbuncle on the back of the neck during the first days of February, 1919. Shortly thereafter the patient became feverish and drowsy, complained of blurred vision and diplopia and developed bilateral facial paralysis. There was neither vertigo nor vomiting, but pain of considerable severity was felt over a circumscribed area in the right parietal region which, judging from the patient's own description, had all the characters of "clavus hystericus." He soon showed evidence of some weakness in the extremities on the left side and exhibited restless movements in the trunk and extremities. He was seen at that time by a consultant and lumbar puncture was performed. The spinal fluid is said to have been entirely negative. The blood and urine were likewise negative. The patient had a slow and tedious convalescence with unsatisfactory retrogression of some of his disturbances and decided aggravation of others.

Examination.—When seen by me for the first time, May 5, 1919, he complained of recurrent facial weakness, disordered speech and uncontrollable movements of his face and extremities. Neurologic examination showed that his contentions were justified. Whether standing or sitting some part of the body was almost constantly in motion, the face and left lower extremity assuming the major share of the otherwise general instability. In the sitting posture the trunk exhibited rather slight oscillations either forward and backward or laterally, the head was slowly rotated from side to side and at the same time thrown slightly backward, the eyes were held semiclosed by the constant wrinkling of the forehead and orbiculopalpebral spasm, the expression being typically that of one attempting to distinguish a distant object in the full glare of the sun, with perhaps the added appearance of acute anxiety and distress. The angle of the mouth on either side was likewise occasionally retracted and the lips curled or twisted in various ways. The hands and forearms were now and then the seat of restless fidgety movements of prona-

tion together with clutching movements of the fingers, but the unrest manifested in the upper extremities was minimal when compared with that observed in the lower extremities. There was ceaseless shuffling of both feet and more particularly of the left foot which was constantly displaced forward and backward or laterally, or else only the heel or forepart of the foot was alternately moved inward and outward. Occasionally the knee was repeatedly adducted and abducted. His gait showed slight dragging of the left lower extremity with uneven stepping. There was no gross paralysis in the limbs, he could execute all the ordinary movements usually tested but his motor power was generally subnormal with more appreciable loss on the left side. His grasp, registered with Mathieu's dynamometer, gave 70 on the right side and 50 on the left. The tendon reflexes were all hyperactive and distinctly more so on the left side, but neither ankle clonus, Babinski nor Oppenheim phenomena could be elicited. The abdominal and cremasteric reflexes were not obtained. The left facial nerve was decidedly paretic in its lower branch, faintly so in its upper branch. Ocular excursion was excellent in all directions save as regards convergence which was practically nil. The pupils were small, perfectly rounded and reacted neither to light nor to accommodation. The eyegrounds were negative. His speech was dysarthric with occasional approach to explosiveness and his voice was distinctly high pitched. The tongue was not deviated when first protruded though it was afterward constantly shifted from side to side. The soft palate and pharynx appeared functionally normal. During the entire consultation the patient emitted plaintive grunting sounds, which manifestations may, however, have been purely hysterical features as the man had always been a rather high strung nervous individual. This symptom was not present at subsequent examinations. There were no disturbances of superficial and deep sensibility nor of the special senses and the general physical findings were negative. The intellectual faculties were absolutely intact.

Course.—I did not have the opportunity of seeing this patient again until Sept. 23, 1919. He then complained of transitory pain and soreness on the top of the head and was still restless, uneasy and mentally distressed by his prolonged illness. Physical examination revealed, however, a striking amelioration. His motor strength had largely returned, his grasp now registered 120 and 110 with the dynamometer, his facial palsy had entirely cleared up and his gait was normal. The pupils, however, remained totally reactionless, speech was still defective with a tendency to explosive features and he continued to exhibit the slow unceasing contortions of the face and the restless movements of the left leg and foot. The grimaces and head displacements had all the characters of genuine athetosis whereas the movements in the extremities were more closely akin to choreiform disturbances.

He was seen again Nov. 12, 1919, Jan. 12, and April 16, 1920, and his condition had not materially changed except as regards steady improvement in general strength and nutrition.

Case 2.—L. S., a man 27 years of age, married, employed in a cigar factory, born in Poland, which he left when still young, could give no definite information concerning his family history.

History.—Aside from the ordinary diseases of childhood, he had always enjoyed excellent health, was a diligent worker, used tobacco in moderation and denied alcoholic indulgence and venereal infection. He was sent to me, Oct. 10, 1919, by a former pupil for an opinion regarding the nature and prognosis of very severe muscular twitchings which had developed progres-

sively after an obscure meningeal disorder associated with severe mental derangement. The history of the events which led up to his present condition was supplied by his physician who stated that the patient had had a severe attack of influenza during November, 1918, from which he recovered with extreme slowness. Early in January, 1919, he rapidly developed acute mental disturbances with maniacal agitation and during three weeks was absolutely out of his mind and had to be constantly watched and frequently restrained. A detailed account of all the features of this illness unfortunately could not be obtained except the fact that this transitory mental disturbance was accompanied throughout by fever, rigidity of the neck and frequent jerky movements in the head and extremities. Meningitis was suspected and lumbar puncture performed. The fluid was clear, contained many cells and gave a strongly positive globulin reaction but contained no organisms. The Wassermann reaction was negative. He improved after the lumbar puncture and his psychic manifestations rapidly subsided but in the latter part of February, about three weeks after the cessation of his febrile and delirious state, he began to develop almost constant choreiform movements which became practically generalized.

Examination.—Neurologic examination, Oct. 1, 1919, disclosed as the most striking and prominent feature decided spasmodic excursions of the patient's head consisting of constant, rather coarse and ample displacements, somewhat resembling those of Huntington's chorea though far less rapid in execution. The head was rotated from side to side and especially obliquely hyperflexed on the chest then obliquely hyperextended backward in such a way that during the extensor phase the ear was approximated to the shoulder and the face turned upward toward the opposite side, thus recalling the appearance seen in spasmodic torticollis. At the same time the face exhibited the most diverse contortions, such as slow winking and frowning movements, retraction of the corners of the mouth or puckering of the lips, occasionally interrupted by more rapid myoclonic twitchings of the entire musculature of the face, particularly on the right side. The right arm and leg likewise exhibited almost constant movements, but these were relatively less striking, were almost confined to the distal segments of the extremities and consisted of pronation and supination of the forearm and hand, flexion and extension at the wrist, flexion and extension as well as abduction of the fingers, adduction and elevation of the foot and flexion and extension of the toes. There were no gross movements at the larger joints of the extremities but occasional shrugging of the shoulders and irregular oscillations of the trunk were visible when the patient changed from the recumbent to the sitting posture or from the latter to the standing position.

There was no Romberg sign and the gait presented nothing unusual though the patient maintained that he frequently could not control his steps, felt inclined to pitch forward and sometimes walked like a drunken man. As usually occurs in ordinary chorea the involuntary movements in the extremities stopped completely or almost when the patient executed commands, and members of his family stated that all twitchings usually ceased during sleep. It was difficult to designate correctly the spasmodic movements observed in this patient; they had nothing in common with the rhythmic myoclonic manifestations seen in various parts of the body in a fair percentage of cases of epidemic encephalitis; they borrowed the features of both chorea and athetosis and for this reason it has seemed more practical to label this form the choreo-athetoid type. In reality, however, confusion existed mainly as

regards the twitchings in the extremities which greatly resembled choreiform movements though they were much less rapid and jerky than the latter and recalled by their relative slowness and labored execution the usual appearance of athetoid spasms. The spasmodic phenomena exhibited by the head and face were, on the contrary, absolutely identical with those seen in typical cases of bilateral and hemi-athetosis.

There was no motor paralysis in the extremities, but a certain element of rigidity was demonstrable more especially on the right side. With Mathieu's dynamometer the grasp was 120 on the right and 100 on the left. The tendon reflexes were very active but of symmetric intensity and were not accompanied by clonus nor by Babinski and Oppenheim phenomena. The tongue was protruded in a jerky manner and rolled from side to side or curled up in the roof of the mouth. The soft palate and pharynx appeared normal and phonation was perfect but speech was somewhat defective with frequent approach to stuttering or explosive in character, perhaps by reason of the unceasing labial spasm. A definite palsy of the right lower facial nerve was evident. Ocular excursion, pupillary responses and eyegrounds were normal. The special senses, general sensibility and sphincter control were undisturbed. The patient was anxious regarding the outcome of his affection and distressed by his enforced inoccupation but presented no evidence of mental deterioration. His mode of behavior, attention, memory, and judgment were all carefully studied and there appeared no residue of his previous psychic derangement. The heart, blood pressure, blood and urine examinations yielded negative findings. The patient had come from a distant city and unfortunately was never seen again despite repeated endeavors to locate him.

Case 3.—F. R., a married housewife, 34 years of age, had had no children and no miscarriages, and aside from a rather prolonged attack of chorea at the age of 14 and recurrent tonsillitis her past history presented nothing of unusual interest.

History.—During the latter part of February, 1919, she had a moderately severe influenzal infection from which it was claimed she never fully recovered. Early in June, 1919, she began to have pains in the back, neck and shoulders, felt weak and unsteady on her feet, complained of not seeing objects clearly, seeing double whenever she directed her gaze to the right and having distaste for all food. Within a few days she developed slight fever, muscular twitchings in the neck, hands and left hypochondrium and became so drowsy that her family physician became alarmed and requested a consultation.

Examination.—When first seen by me, June 10, 1919, the patient lay perfectly quiet in bed apparently in a peaceful slumber with flushed face, moist skin, rather slow and irregular respiration and a temperature of 101.2 F. She could be aroused without difficulty, executed commands quite well and answered all questions intelligently. She stated that she no longer had pains anywhere except in the back of the head but felt terribly tired and saw everything through a heavy veil or mist. She remained perfectly immobile during questioning except for occasional rather rhythmic and shocklike twitchings in various parts of the body, notably in the neck, left arm and abdominal wall. The cervical spasm tilted the head backward and to the left; in the arm the main movement occurred at the wrist and consisted of spasmodic flexion of the hand resembling cortical spasm, while in the abdomen there was rhythmic recession of the left hypochondrium somewhat analogous to what takes place in hiccough. Rarely, similar though less typically myoclonic twitchings were likewise seen in the left leg or on the right side of the

body. These various spasms were rapid and jerky like those of chorea but differed from choreiform manifestations by reason of their relative uniformity or rhythmic character. There was a faint drooping of the eyelids and a distinct though asymmetric bilateral prosopoplegia, the right facial musculature being more involved than the left. The physiognomy presented a fairly typical Parkinsonian mask perhaps conditioned by the bilateral facial weakness. The eyes followed the finger in all directions but excursion was slow and attended by definite nystagmus, both horizontal and vertical. The pupils reacted sluggishly and imperfectly to light and to convergence. The eyegrounds were distinctly congested and the disk outlines hazy. There was slight dysarthria but no involvement of the tongue, soft palate or pharynx could be detected. The extremities were free from actual paralysis but a tendency to generalized rigidity was present and the tendon reflexes throughout were hyperactive and equal on the two sides. There was neither Babinski nor Oppenheim phenomenon. The arms presented no evidence of either ataxia or adiadokocinesis but an intention tremor appeared when the patient carried the finger tip to the nose or attempted to take a small object from the examiner's hand. General sensibility, special senses and organic functions were undisturbed. Owing to the gravity of the patient's illness it seemed unwise to get her out of bed for the purpose of testing her gait, but it was learned from the family that for two or three days prior to taking to her bed the patient walked in a very irregular fashion, her body swaying from one side to the other. Lumbar puncture was advised but refused. Three days later the patient's condition was decidedly worse, the drowsiness greater, the fever higher, the twitchings more accentuated and constant and furthermore nocturnal agitation with hallucinatory manifestations appeared. It was then decided to proceed with lumbar puncture. The fluid came out under considerable tension, was perfectly clear, contained 56 cells to the cubic millimeter, gave a strongly positive globulin reaction, a negative Wassermann reaction and an indefinite gold curve. The blood showed a leukocytosis of 17,000 and yielded a negative Wassermann reaction. The patient's condition seemed to have been materially improved in every respect, but the involuntary spasmodic phenomena persisted. A second lumbar puncture, performed June 20, 1919, showed a cell count of 35 and a still markedly positive globulin reaction.

Course.—From this time on steady amelioration occurred and the further history was supplied by the physician in charge who stated that within a week the temperature became normal and remained so. The drowsiness, ptosis, nystagmus and dysarthria disappeared within three weeks and by that time the patient had been allowed to be up and about the house. She continued, however, to present her peculiar jerkings of the head and the restless movements of the hand which had rather increased. Her convalescence was completed in the country and I unfortunately did not see the patient again until several months later.

The patient finally reported at the office, Dec. 15, 1919, in a state of profound mental depression because of the uncontrollable twitchings which practically incapacitated her and rendered life intolerable. To my great surprise her spasmodic manifestations had not only very decidedly increased in severity but had moreover assumed quite a different character. The musculature of the neck and shoulders was the seat of a most extraordinary and persistent spasm. The patient's head was rigidly hyperextended, then slowly rotated from side to side and at the same time deeply buried between the

spasmodically elevated shoulders, giving the impression of an attempt at telescoping the head through the trunk. The spasm, which was essentially tonic in character, lasted two or three minutes, evanesced, then reappeared after an interval of from a few seconds to a minute and was accompanied during the greater part of its exhibition by tonic bilateral contraction of the platysma myoides, more marked on the right side. Had I not seen this patient during the acute phase of her malady, I would have been much inclined to look on this cervical spasm as a purely hysterical phenomenon. However, the other twitchings also had persisted and were plainly in evidence. During the spasmodic excursions of the head, which was more commonly lowered toward the left shoulder with consequent deviation of the chin toward the right, the facial musculature likewise participated in the elaboration of the twitching phenomenon, being animated by irregular pouting of the lips and frowning movements in the forehead. The left upper extremity, particularly the hand and fingers, constantly executed slow and irregular movements closely resembling athetoid spasm. The hand was pronated and deviated outward or hyperextended and the fingers alternately flexed and extended or spread apart, the thumb and index finger being apparently more involved than the other fingers. Only an occasional restless displacement was observed in the left foot. No contractions occurred at the larger joints of the extremities on the left side and none was seen anywhere on the right side of the body save the spasmodic shrugging of the shoulder previously noted. There was no evidence of motor weakness although an accurate evaluation of the grasp of the left hand was rendered impossible by the constant displacements of the fingers. The whole left side seemed distinctly more rigid than the right and exhibited more active tendon reflexes. There was neither ankle clonus, Babinski nor Oppenheim phenomenon. The patient was a highly nervous woman and developed a marked tremor throughout the upper extremities when asked to hold the arms quietly extended in front of her with fingers spread widely apart. A trace of ataxia was present in both arms. Ocular excursion was perfect in all directions and the pupils were rather small though yielding normal light and accommodation responses. The eyegrounds still showed rather full and tortuous vessels with otherwise negative disks. Examination of all of the other cranial nerves was negative save for the various muscle spasms previously mentioned. General sensibility, sphincteric control and trophic functions were intact. The heart dulness could not be satisfactorily mapped out owing to the patient's adiposity, but a loud systolic murmur was present over the apex and distinctly transmitted toward the scapula.

The patient was seen again Jan. 5, Feb. 26, and April 14, 1920, and while she thought that some improvement had taken place under administration of bromids and hyoscin hydrobromid, I could see no material change in her various spasmodic manifestations.

SUMMARY OF CHOREO-ATHETOID SYNDROME

All three cases included in the preceding series developed, within a period of three months after a typical attack of epidemic encephalitis, a syndrome characterized by choreo-athetoid spasms in the face, neck and extremities. The original manifestations of the encephalitis corresponded to the usual clinical type except in one case in which very severe mental disorder and maniacal agitation constituted the essential

features of the symptomatology. None of the patients presented at any time evidence of external ophthalmoplegia, but in one case a permanent paralysis of the intrinsic ocular musculature was noted. In only one case was definite lethargy observed while in all three the facial musculature was distinctly involved either on one or on both sides. In a general way the so-called characteristic triad, lethargy, asthenia and oculomotor paralysis was reduced to its minimum expression in this series of cases. The predominating feature in all was the rapid and progressive elaboration of a choreo-athetoid syndrome essentially unilateral in distribution and remarkable for the exaggerated participation of the cervical and facial musculature. It is interesting that in all three cases more or less definite hyperkinetic phenomena of this same type were already recognizable in the initial phase of the disease. While the character of the twitchings at first was perhaps not absolutely pathognomonic, the spasmodic movements in the later or convalescent stage of the affection were fairly characteristic, being of the nature of athetosis in the face and neck and on the contrary more closely analogous to choreiform jerkings in the extremities. In Case 3, however, the spasms eventually assumed almost classic athetoid features, both in the neck and in the extremities.

CHOREOPSYCHOTIC TYPE

CASE 4.—G. A., a married housewife, aged 38, was seen by me only once and her history was obtained from the attending physician on the occasion of a consultation held Oct. 17, 1919.

History.—Aside from what was regarded as a relatively mild and even doubtful attack of influenza in the early part of September, 1919, there was nothing of unusual importance in her history. The first symptoms of her illness had appeared from eight to ten days before I saw her and consisted mainly of severe pains in the left occipital region, in the back of the neck and left shoulder and radiating into the left arm. This was interpreted at first simply as neuralgia. Within two or three days, however, it was followed by mild fever, diplopia, peculiar nodding movements of the head, muscular twitchings in the left arm and rapidly increasing tendency to nocturnal agitation, mental confusion with marked disorientation and eventually by hallucinatory delirium. She was fairly quiet during the day although at no time lethargic and rarely slept more than an hour at a time. The physician and the two attending nurses stated that at night more especially the patient constantly tried to get out of bed, had to be closely watched, fretted about the care of her house and spoke of nothing except the necessity of personally directing the management of her household. She would sit up in bed, point her finger toward a corner of the room and, as though speaking to her servant whom she called by name, she would carry on an imaginary conversation, giving detailed orders for tasks which it was known she had previously planned to carry out. She would insist on definite answers and accounts, remonstrated, pleaded or approved, and continued in this manner a good part of the night. She was totally disoriented for time and place

but recognized her doctor every time he came into the room and named him correctly. During the day she had lucid intervals when she seemed to realize that her mind had wandered the greater part of the time and she would herself call attention to the silly things she had said and done, but usually she would almost immediately lapse back into her dreamy and confused mental state. Her temperature had oscillated between 99.6 and 100, and never exceeded 101.6 F. She took nourishment rather reluctantly, had no difficulty in swallowing and retained control of the sphincters.

Examination.—When I saw the patient Oct. 17, 1919, she was lying on her back with half closed eyes and a dreamy countenance. The first fact which attracted my attention was the peculiar and practically constant nodding of the head. This consisted in a fairly rhythmic and rather jerky spasmodic rotation of the head to the right with very slight associated backward tilting. The left arm also exhibited constant irregular and jerky movements consisting of pronation and supination of the forearm and hand, flexion and extension of individual fingers with frequent picking at the bed clothes. Restless movements and displacements also occurred in other parts of the body but were much less frequent and noticeable. By talking rather sharply to the patient and constantly urging her it was possible to proceed with a fairly satisfactory neurologic examination. At rest there was slight drooping of both eyelids and an appearance of mild divergence of the eyeballs but the patient could be made to follow the finger in all directions. No definite ophthalmoplegia was evident but a well marked vertical nystagmus was present and the patient claimed that she saw double whatever the direction of her gaze. The pupils were small and reacted sluggishly to light. The eyegrounds were distinctly congested and the outline of the right disk poorly defined. The facial musculature was flaccid on both sides and showed appreciable paresis. There was no gross paralysis in the extremities and all movements were executed but the left arm appeared diffusely paretic and atonic. Both arms presented slight ataxia and well marked intention tremor. When the patient sat up in bed the nodding of the head became less constant and was largely replaced by a coarse intention tremor such as occurs in advanced cases of multiple sclerosis. The tendon reflexes were all hyperactive but without accompanying ankle clonus or Babinski-Oppenheim phenomena. The abdominal reflexes were abolished and the stroking intended to elicit them was followed by unusually pronounced dermographia. The tongue showed no deviation but was only imperfectly protruded and speech was slow, monotonous and definitely dysarthric though usually intelligible. The temperature at this time was 99.8 F., the pulse rate between 110 and 120 and the respirations rather shallow and irregular. Lumbar puncture yielded a perfectly clear fluid under moderately increased pressure. The cell count per cubic millimeter was 32, the globulin reaction strongly positive (+++), the Wassermann reaction negative in all dilutions and the colloidal gold curve negative.

Course.—Four days later I was informed by the attending physician that lumbar puncture produced no amelioration in the patient's condition. She continued her nocturnal agitation and hallucinatory manifestations but rapidly became more drowsy during the day, showed signs of increasing exhaustion, developed dysphagia and hypoglossal paralysis and died three days after I saw her from respiratory paralysis. Unfortunately a necropsy could not be secured.

CASE 5.—J. W., aged 43, a man, married, a shipping clerk by occupation, was seen in consultation with his physician, Jan. 30, 1920.

History.—Aside from an attack of sunstroke several years before, his past history was exceptionally good and he had always been a perfectly healthy and active man. No influenzal infection preceded the present illness which began, January 24, with paroxysms of pain in the occipital region and diplopia. The latter symptom annoyed him so much that he had all the pictures on the wall of his room removed. His temperature rose to 101 F., and remained at that point for a few days; the diplopia disappeared after three days, but the occipital pains persisted and at times gave him considerable distress. There was no paralysis anywhere at this time according to his physician and the superficial and deep reflexes were undisturbed. The patient soon assumed a drowsy and passive attitude and would lie for hours with eyes closed, totally indifferent to whatever took place about him and except for slight choreiform twitchings in the upper and lower extremities appeared perfectly quiet as though in a peaceful slumber. He could be aroused without difficulty, carried on conversation regarding the weather conditions, his state of health, etc., but soon drifted into details pertaining to the work in which he was engaged prior to the onset of his illness. His work seemed uppermost in his mind and he frequently muttered something in regard to it, became markedly disoriented for both time and place, but recognized those about him and called them by name though he took no further interest in their doings and never passed any remarks when letters received from a member of his family who had just left for a neighboring city were read in front of him. At night especially, though sometimes during the day, he became more markedly confused and restless, would sit up in bed and talk incoherently for long periods, almost invariably referring to some phase or other of his occupation and exhibiting by both word and gesture unmistakable evidence of hallucinatory delirium. The necessity of carrying out some given task seemed all absorbing and he frequently insisted on getting hold of a box he had to fix. He tried to get out of bed on several occasions but was never violent and could always be induced to lie quietly and obey the doctor's orders.

Examination.—When I first examined this man, January 30, I was surprised to find relatively little objective evidence of serious organic disease. He was rather somnolent but easily aroused, answered questions quite well, executed all commands and appeared perfectly rational. He readily lapsed back, however, into his habitual state of indifference and mental inertia. Restless and jerky movements were observed in the extremities but only at intervals and consisted in the arm of flexion at the elbow, flexion at the wrist and ulnar deviation of the extended and abducted fingers. In the lower extremity abduction of the thigh and extension of the foot and toes predominated though at times the whole limb was the seat of a more violent kicking movement. These various twitchings had a jerky spasmodic character and involved all four extremities but were rather more frequent and pronounced on the right side. No analogous twitchings were seen in either the face or neck. A very faint hemiparesis was present on the right side affecting the lower facial region as well as the extremities. Otherwise no paralytic disturbances were observed. All of the cranial nerves were intact and not the slightest implication of the ocular muscles could be detected. The pupils were small, in fact almost myotic, but nevertheless yielded normal light and accommodation reflexes. The cutaneous reflexes were rather sluggish

but the tendon jerks were readily elicited though without appreciable exaggeration. The plantar reflexes were normal. No disorders of general or special sensibility were discovered and sphincter control was perfect except during a period of twenty-four hours at the beginning of the second week of the illness when the patient had to be catheterized. Examination of the eyegrounds disclosed negative findings.

Course.—This was the mildest case of the series and the entire symptomatology consisted at this time of more or less drowsiness, fairly persistent mental confusion, disorientation with episodic hallucinosis and jerky twitchings in the extremities. Lumbar puncture gave a perfectly clear spinal fluid with a direct cell count of only 15 per cubic millimeter but a strongly positive globulin reaction (+++). The Wassermann and colloidal gold reactions were negative. Unfortunately no blood examination was made. The urine showed no abnormal constituents. The patient was apparently markedly benefited by lumbar puncture and was much clearer mentally and quieter physically for three or four days, after which the former state of affairs gradually reappeared. He was seen again, February 13, and seemed to me much less drowsy than on the previous occasion and less restless and jerky. A second lumbar puncture was performed, the cell count was reduced to 7 and the globulin reaction was only faintly positive (+). From this time on the patient showed rather steady improvement in all respects and during the fifth week began to sleep in more natural fashion and at more conventional hours. The pseudochoreiform twitchings gradually subsided and he took a more active interest in his family and surroundings. Nothing further of importance was recorded by his physician. The patient at my request reported at the office for examination, April 22, and a complete survey of the neurologic functions was carefully made. He complained of paroxysmal twinges of pain in the right suboccipital area and right side of the face but apart from infrequent winking of the eyes and very defective wrinkling of the forehead and elevation of the upper lip, all of which gave him a rather definite Parkinsonian facial appearance, absolutely no objective evidence of residual disturbance was detected. No twitchings were observed anywhere and his psychic faculties were intact. He was considered to have virtually recovered.

Case 6.—T. G., a man, 45 years of age, married, assistant manager of a contracting and building concern, an Italian by birth, a rather high strung and impulsive individual, was considered an unusually able business man, used tobacco rather excessively but aside from light wine at occasional dinners never indulged in alcoholic stimulants.

History.—With the exception of the ordinary diseases of childhood and typhoid fever at 20, he had always enjoyed remarkably good health and was steadily active at his work. In the early part of December, 1919, he contracted a severe cold and subsequently developed influenzal manifestations with fairly sustained high temperature and apparently bilateral bronchopneumonia. He was confined to his bed for about three weeks and took fully another month to regain his strength and energy. He came home, Feb. 20, 1920, complaining of lassitude, headache, dizziness, pains in the back and legs and blurred vision. His family physician was called, found no fever but nevertheless ordered him to bed and gave him a calomel and saline purge together with aspirin. The following evening he felt much better and planned to return to his office on the succeeding morning but not being permitted to do so became greatly exercised and agitated, abused the doctor, refused to eat and quarreled with every one in the house. From this time on he rapidly

developed quite a striking series of motor and psychic disturbances, became restless, paced the floor a large part of the time, showed tremor in the hands and irregular facial twitchings, would not go to bed and constantly talked of gigantic building plans which would place him at the head of the largest building corporation in the country. During the night he would occasionally lie down for an hour or so but even then continually muttered to himself or called out in a loud voice, giving orders to his subordinates and carrying on lengthy conversations with his associates. At no time did he show any evidence of drowsiness or apathy.

When I saw the patient in consultation, March 2, 1920, he was still restless but perfectly manageable and even morbidly good-humored though he became antagonistic the moment he learned the purpose of our visit. He persisted in saying that he did not need the services of a physician, that he was not ill, had never felt better, in fact, but that nobody understood him, that his own people were against him, believing him mentally unsound when in reality he was conceiving great schemes which were bound to triple the business of his firm and lead to his own advancement. He confided to the doctor that he had been most fortunate in recent speculations, had large sums stored away in some New York banks and that he contemplated building a magnificent residence in the suburbs of the great metropolis where his wife and two daughters would finally have the opportunity of entering the world of wealth and culture to which they belonged. This and similar grandiose ideas were the dominating features of his mental operations and evidently accounted for his visible exuberance and the outbursts of laughter which frequently interrupted our subsequent examination. During most of this introductory conversation he either stood up, shuffling his feet, or paced the floor; occasionally he sat down, but some part of the body was constantly in motion and one was instinctively reminded of what Charcot called "choreiform instability." One foot or the other was pushed forward or retracted, the heel or the forepart of the foot was displaced mesially or laterally, the knee was repeatedly adducted and abducted, the hand and forearm were slightly pronated and supinated, the hand was extended and irregular drumming or grasping movements of the fingers were executed. These various movements had a jerky and spasmodic character, and occurred on both sides of the body but were more pronounced on the right side. The head was frequently turned to one side, but without spasmodic element, and facial twitchings consisting especially of a clonic quiver of the cheeks and elevation of the eyebrows were almost constant. The facial contractions were much accentuated when he was requested to follow the finger with the eyes, close the eyes or elevate the upper lip. The twitchings in the extremities on the contrary diminished when the patient carried out designated movements and were replaced by a coarse tremor.

Examination.—He was a rather thin but muscularly developed individual of medium stature. The various tests for motor functions revealed no paralysis in the extremities but a marked and rather coarse intention tremor appeared whenever he held the extended arms directly in front of him or carried the finger to the tip of the nose. A similar tremor was present in either lower extremity on elevating it to touch the examiner's hand with the big toe. The tremor did not progressively augment in amplitude as is usual in multiple sclerosis, and no associated ataxia or dysmetria was observed. His grasp was powerful and equal on the two sides. The tendon jerks were all hyperactive but unaccompanied by either clonus or pathologic responses

of the great toe. The umbilical and cremasteric reflexes were retained. The cranial nerves presented only slight abnormalities. There was a definite ptosis on the left side and the facial musculature on that side was relaxed, the angle of the mouth drooping distinctly on elevation of the lip. Ocular excursion was excellent in all directions save for convergence which was practically nil, and a faint nystagmus appeared when the eyes were carried to either the extreme right or left. The pupils were small, perfectly rounded, equal in size and reacted neither to light nor to accommodation efforts. Examination of the eyegrounds was negative. The tongue was protruded well and without deviation, but showed a fine fibrillary tremor at the tip and along the lateral borders. The closed eyelids presented a marked tremor. Speech was not materially affected, but occasionally the patient seemed unable to find his word, stuttered and mispronounced the word particularly if asked to repeat a difficult one. There was no involvement of the organic sphincters and no disorders of general or special sensibility.

In many ways the physical examination was unsatisfactory and many tests could not be properly carried out owing to the patient's psychic condition. His attention was easily diverted and it was plain that his mind was elsewhere, deeply engaged in the pursuit of his delusional consolations. Moroever, he constantly interjected sarcastic remarks regarding the examination, cracked jokes about doctors in general, or indulged in loud and prolonged laughter. This was clearly akin to what has been described as "witzelsucht" or "moria." His memory was shown by careful control to be grossly defective and he gave a most erroneous account of certain important incidents which had interested him prior to his influenzal infection.

Evidently the clinical physiognomy of this case was so strongly suggestive of general paresis that diagnosis was impossible without further observation and laboratory tests. Lumbar puncture yielded a perfectly clear fluid under moderate tension giving a cell count of 34 per cubic millimeter and a well marked butyric acid reaction for globulin (++). The colloidal gold curve in this case showed a definite discoloration in the first four or five tubes, but the Wassermann reaction was negative in all dilutions. The blood Wassermann reaction was likewise negative. The leukocyte count was 11,000 and the urine practically normal in every respect.

Course.—The patient was rather more quiet, both physically and mentally, during the two days following lumbar puncture, but soon he began to exhibit the same motor unrest, irregular jerky movements and delusional manifestations of grandiose type. His various symptoms did not materially change until approximately two weeks later, when he suddenly became semicomatose after a night of unusual agitation with prolonged shouting and wild delirium. When seen on this occasion, March 18, he was profoundly somnolent, could barely be aroused, merely muttered unintelligibly in answer to questions, would not protrude the tongue nor squeeze the hand, but nevertheless swallowed food placed in his mouth. His breathing was rapid and irregular, occasionally slower and stertorous, his pulse was rapid, oscillating between 120 and 130, but perfectly regular, and his temperature by axilla 100.2 F. This time he again almost constantly presented rapid and irregular jerky displacements of his extremities and facial twitchings. This stuporous state lasted a little more than a day and was followed by a recrudescence of the hallucinatory delirium and delusional wanderings. He was totally disoriented, no longer seemed to recognize those about him, refused medicine and sometimes food, talked incoherently the greater part of the time and lost all concept of propriety, voiding

in bed or on the floor. A similar stuporous attack appeared March 24 and lasted almost three days. Lumbar puncture performed at this time again gave a perfectly clear fluid with a cell count of 60 and a strongly positive globulin reaction. Although considerable fluid was withdrawn, the procedure did not modify the patient's condition in the least and when he regained consciousness he at once started to display his previous motor agitation, mutterings and absurd ideas. He was, moreover, perceptibly weaker, seemed to use the right extremities in a weak and ataxic fashion and could be more easily restrained. He took little nourishment, swallowed with some difficulty and in a few days gradually became comatose for the third time, developed Cheyne-Stokes' breathing, paroxysmal hiccough, marked dysphagia and a rising temperature. The spasmodic jerkings eventually subsided and he died, April 4, after three days of coma.

Necropsy.—A limited necropsy was obtained, examination of the brain only being permitted, and we had to be content with removal of fragments for microscopic examination. However, enough information was secured to establish positively the anatomic diagnosis.

The brain was remarkably edematous both on the surface and on section and the leptomeningeal vessels at the base and over the frontoparietal region were distinctly engorged. The histologic findings corresponded to the lesions thus far described by other observers. There was only discrete infiltration of the pia with mononuclear cells, whereas the intracerebral vessels, more particularly the veins, were markedly distended and showed extensive adventitial infiltration. A diffuse interstitial infiltration was likewise present, but no definite glia hyperplasia was detected. Minute hemorrhages were found in the midbrain and corpus striatum, but were particularly abundant in the subcortex of the left frontal lobe. There were no advanced degenerative changes in the ganglion cells, but merely rarefaction with imprecision of the tigroid substance and a more or less diffuse staining reaction. These various lesions were practically identical at all levels examined, but seemed more severe and extensive in the cortex and particularly in the subcortex of the frontal regions. It was in this area that the vascular changes were most striking and the pial infiltration most pronounced. The larger pyramidal cells were largely deprived of chromatin granules and many were surrounded by the infiltrating cells. Nowhere did the blood vessels exhibit the characteristic structural modifications found in syphilis and paresis.

Case 7.—I. W., a man, 40 years of age, married, a tailor by occupation, was admitted to the public wards of the Albany City Hospital, March 29, 1920, complaining of nervousness, weakness and pains in the neck, back and in both arms from the elbows to the tips of the fingers. These pains had occurred in paroxysms since a severe cold contracted March 8, 1920.

History.—His family and past history were unimportant. He stated that he had enjoyed relatively good health, had always been a hard worker, slept little, used alcohol in moderation and had never contracted any venereal infection.

The present illness began about March 8, 1920, when he contracted a severe cold lasting several days, during which he felt feverish and fagged out. Then paroxysmal intense pains appeared in the neck, back, chest and upper extremities. At the time of admission he stated that the pains were no longer of great severity and that numbness and tingling in the arms and hands were the most annoying symptoms. General physical examination by the house physician

revealed nothing of serious nature and his temperature was normal, but he appeared nervous and restless and exhibited occasional facial twitchings and jerky movements in the extremities. Two days later he began to show evidence of mental confusion and disorientation, especially at night, and developed involuntary and incoordinate muscular twitchings throughout the body, but more particularly in the facial and abdominal musculature. His skin was unduly moist, his face pallid and his pulse rapid, ranging from 100 to 130. His symptoms rapidly became more accentuated and mental confusion, marked disorientation for time and place, together with motor unrest, appeared, especially at night, alternating by day with periods of drowsiness during which he muttered incoherently. At night it was impossible to keep him in bed; he wandered about the ward, got in bed with other patients, crept about the floor engaged apparently in finding some lost object, entered the lavatory and laid out towels and cloths as though in the act of folding or pressing clothes. When asked what he was doing he retorted that he was a tailor and had to do his work. The blood showed a leukocyte count of 12,000. The urine showed a trace of albumin and a few finely and coarsely granular casts.

Examination.—At the neurologic examination, April 1, 1920, the patient was found lying relatively quiet in bed with no indication of the nocturnal tendency to irrepressible agitation. He did present, however, frequent facial twitchings and contortions and almost constant and definitely choreiform movements in the hands and fingers as well as in the lower extremities. There were no gross displacements of the trunk nor coarse and ample movements at the larger joints of the extremities, but one finger after another was flexed, extended or abducted, the hand flexed, extended or supinated, the knee adducted or abducted, the foot flexed and adducted or extended and the toes similarly displaced. Otherwise he looked drowsy and apathetic and his facial expression was distinctly masklike. The eyes followed the finger in all directions and no ophthalmoplegia could be detected, although at rest a slight divergent strabismus was evident, perhaps more marked on the right side. The pupils were small and reacted sluggishly to light and convergence efforts. The imperfect elevation of the upper lip suggested a faint paresis of the facial nerves. The tongue protruded well and without initial deviation, although it was constantly moved about, presumably participating in the general choreiform instability. There was no motor paralysis in the trunk and extremities, but the grasp was decidedly weakened, more so on the right side. The tendon reflexes were all present but hypo-active. Neither the Babinski nor Oppenheim phenomenon was present. The cremasteric and abdominal reflexes were not obtained. The sphincters were perfectly controlled. When the patient assumed the sitting or erect posture he presented a distinct intention tremor of the head. The gait was not characteristic although the patient occasionally took uneven steps and on two or three occasions showed a slight titubation. His speech was dysarthric, but by reason of his foreign birth and limited education it was difficult to interpret correctly this particular detail. At times rapid utterances were followed by slow, hesitating, almost stuttering enunciation. He exhibited amnesia for both remote and recent events, but especially for the latter, was not clearly oriented but never appeared antagonistic in the day time and obeyed all requests during the course of examination. The blood Wassermann reaction was negative. The spinal fluid was clear, gave a cell count of 25 per cubic millimeter and a strongly positive globulin reaction by Pandy's method; the Wassermann reaction was negative with 0.5 c.c. The colloidal gold reaction gave the interesting curve 5555421000.

Course.—April 3, 1920, the patient was transferred to the psychopathic pavilion as he no longer could be managed in the general ward. From this time on he exhibited progressively more striking changes in the mental sphere; he continued to wander about at night and to get in bed with other patients. One dominant idea seemed persistently to absorb his mind and command his activities and this was the necessity of pursuing his usual work as a tailor. He repeatedly stated that he was working at his trade and this imperative concept probably explains the fact that he constantly was found busily engaged in definite tasks with his bed clothes which he either spread out carefully on the floor, wound about his person or tied up in bundles. At other times, however, his aberrations migrated into other channels and he ran about the rooms talking incoherently or laughing and singing as though in jovial mood. Night after night he crept out of bed and could not be induced to return to it, although only once did he develop any tendency to wild delirium and opposed strong resistance to physical restraint. On one occasion he was found sitting beside his bed muttering to himself in a low tone and when asked why he did not go to bed he stated that there was no place for him, the bed was filled with babies, he could see, feel and hear them, he knew they were not his own children, but of course he would not disturb nor harm them. This state of affairs continued without much change during two weeks, but the patient was nevertheless losing ground physically as well as mentally despite the fact that he ate his meals without urging and even seemed to relish his food. During this period his temperature oscillated between 99 and 101 F., he slept less and less even in the day time, showed increasing motor weakness, looked haggard and utterly exhausted and betrayed evidence of mental depression. His muscular twitchings and choreiform movements rather decreased in severity and his speech became almost unintelligible. Otherwise the neurologic findings were not materially altered. Lumbar puncture done April 6 gave again a perfectly clear spinal fluid which showed a cell count of 23 per cubic millimeter, a well marked globulin reaction by the Pandy and Noguchi methods and a negative Wassermann reaction with 1 c.c. The colloidal gold curve this time was faintly marked and not characteristic. Another examination of the spinal fluid, April 12, showed the cell count to be 150 (?) per cubic millimeter and the globulin reaction still strongly positive.

During the week of April 18 an erythema appeared on the lateral aspect of the right arm and rapidly became infected owing to persistent scratching by the patient so that evidence of a complicating lymphangitis soon made it imperative to keep hot packs over the arm. As the patient constantly pulled off the dressings it became necessarry to keep him in bed and restrain the arms. He rebelled against this measure, but his increasing motor weakness did not enable him to oppose much resistance. The jerky restless movements which had previously diminished in severity again appeared in much accentuated form and could not be interpreted as efforts to get out of bed as there were no coarse truncal displacements nor any attempts to place the unbound lower extremities on the floor. The twitchings consisted of constantly varying movements of the hands and fingers as well as of the feet and toes, together with adduction and abduction of the knees; they were quick, jerky and irregular movements quite similar to those of chorea. The patient was sleepless, muttered a great deal, but his speech had become absolutely unintelligible. April 24, his physical condition remained practically unchanged although he exhibited a new mental attitude, seemed morbidly jovial, amused by our questions and tests and repeatedly laughed aloud for several seconds as though in derision of the

situation. He obeyed simple orders such as showing the tongue or squeezing the hand, but could not be induced to follow the finger with the eyes nor to relax the limbs for estimation of the reflexes. The whole body was rigid and cold, the temperature subnormal, the pulse rapid, ranging between 110 and 130, the tongue heavily coated and the sphincters apparently incontinent. The pupils were moderately wide, but responded actively to light, the tendon reflexes were not elicited, owing presumably to the rigidity. Despite this alarming state of affairs the patient continued to take nourishment satisfactorily and held his ground without much further change until May 5, when he began to show distinct evidence of substantial amelioration. He became more quiet, exhibited less confusion and disorientation, articulated more distinctly and the jerky twitchings of the extremities greatly subsided. A complete neurologic examination practiced May 8 showed a surprisingly excellent condition. The patient answered questions readily, executed commands promptly, appeared perfectly oriented as regards time, place and person, correctly estimated the length of his stay in the hospital, conversed intelligently about his family, his occupation and the onset of his illness and asked how long it would be before he would be allowed to go home. He still exhibited slight jerky twitchings in the hands, knees and feet, but was no longer rigid and could execute all the ordinary movements with the arms and legs. The whole right side seemed slightly weaker than the left and the tendon reflexes on that side were appreciably more active. There was neither Babinski nor Oppenheim phenomenon. The facial musculature on both sides was paretic, but ocular excursion was excellent in all directions, there was no ptosis and the pupils reacted actively to light and accommodation. Speech was still dysarthric but quite intelligible. Sphincteric control was perfect. His temperature had remained normal for ten days and he could now sleep relatively well.

SUMMARY OF CHOREOPSYCHOTIC SYNDROME

This group of cases, like the preceding series, was characterized by a minimum display of the ordinary and more familiar manifestations of epidemic encephalitis. Decided somnolence or relative lethargy was present only in Case 5 and in no case was well marked ophthalmoplegia observed although partial ptosis was noted in two (Cases 4 and 6). Some degree of facial weakness, however, existed in all. The most striking features in this series were the choreiform jerkings and the persistent psychic disturbances. While the twitchings cannot be said to have been absolutely identical with those seen in classic instances of Sydenham's and Huntington's chorea, they were more closely analogous to them than to any other form of hyperkinetic disorder. These spasmodic movements, for the most part at least, were neither coarse tremors, rhythmic myoclonia nor jactitations, but consisted of rapid, jerky, irregular and incoordinate displacements almost never occurring in more than one extremity at a time and for which the term "choreiform twitchings" appears to be the only appropriate designation. The psychotic manifestations included marked and persistent mental confusion, disorientation for time and place, hallucinatory delirium, more particularly nocturnal and delusional states apparently originating in

part from the hallucinations. It is a notable fact that in every case the hallucinations and delusions were intimately related to the usual work or occupation of the patient, who seemed totally enslaved by the fixed idea of the necessity of pursuing his habitual activities. Case 6 is particularly interesting by reason of the remarkably accurate mimicry of the classic features of general paresis. Two of the four cases in this series terminated fatally, a point emphasized by others who have reported more or less analogous types of epidemic encephalitis.

CONSIDERATIONS ON PATHOGENESIS

The choreo-athetoid and choreopsychotic syndromes illustrated by the foregoing series of cases serve to substantiate the claim that in epidemic encephalitis the distribution of the lesions does not always limit itself to the mesencephalon and adjoining areas of the brain, and they likewise furnish an opportunity for tentative localizations in more minute or circumscribed fields within the massive area embraced by the striothalamotegmental region. While no positive conclusions can be formulated regarding the exact distribution of the lesions in the absence of satisfactory necropsies, an attempt at theoretic localization may not be unjustified on the ground that some of the symptoms observed have a well recognized anatomic basis and that much light has been thrown in recent years on the regional substratum of both choreo-athetoid syndromes and certain well defined mental disorders. In a valuable and instructive series of monographs, J. Ramsay Hunt [13] has recently contributed some very interesting personal observations on the pathology of the corpus striatum, particularly with reference to the pathogenesis of paralysis agitans, and at the same time he has collected and carefully analyzed most of the previously accumulated data bearing on such affections as athetosis, Huntington's chorea, progressive lenticular degeneration and allied syndromes. He concluded that there were two syndromes resulting from elective cellular degenerative changes in the corups striatum, namely chorea and paralysis agitans. While there is great fear that the lenticular nucleus, like the endocrine glands, is being unduly called on to assume the pathogenesis of all that remains obscure in the domain of neurologic interpretation, there can be no doubt that chorei-

13. Hunt, J. Ramsay: Progressive Atrophy of the Globus Pallidus (Primary Atrophy of the Pallidal System): A Contribution to the Functions of the Corpus Striatum, Brain **40**:58 (May) 1917; Tr. Am. Neurol. Assn., 1917; The Efferent Pallidal System of the Corpus Striatum: A Consideration of Its Functions and Symptomatology, Tr. Am. Neurol. Assn., 10, 1917; Primary Atrophy of the Pallidal System of the Corpus Striatum, Presented at a meeting of the Assn. Am. Phys., 1917; Clinical Types of Paralysis Referable to the Pallidal System of the Corpus Striatum, Tr. Assn. Am. Phys., 1918.

form and athetoid disturbances are intimately related to minute lesions either within or bordering on the caudate and lenticular nuclei. Several years ago Marie and Lhermitte [14] reported several cases of Huntington's chorea in which they found chronic leptomeningitis, atrophy of the frontal lobes, dilatation of the lateral ventricles and massive atrophy of the corpora striata, of the putamen more particularly. These ganglions together with the frontal cortex presented well marked degenerative changes in the nerve cells, hyperplasia of the glia tissue and definite alterations of the vascular system. Marie and Lhermitte attributed the mental disorder to the meningocortical lesions, and the choreiform manifestations to the changes found in the corpora striata. Reasoning by analogy and having in mind what has already been established regarding the distribution of the lesions in epidemic encephalitis, it is possible to furnish a plausible explanation for the symptomatic groupings observed in the present series of cases. It is true, of course, that in epidemic encephalitis the lesions are too diffuse to warrant precise deductions, but if we assume, as seems perfectly legitimate, that the subacute or chronic course of some cases is due to slowly evolving changes, there is no reason why the meningeal congestion, adventitial lymphocytic infiltrations, interstitial edema, multiple hemorrhagic extravasations and cellular disorganizations occurring in this disease cannot give rise, according to the focal predominance of the lesions, in one case to a combination of pronounced psychotic disturbance and choreiform jerkings, and in the other case to the progressive development of well characterized athetosis or hemiathetosis. In the first instance we have in a certain measure an approach to chronic degenerative chorea differing from it of course by reason of the more abrupt development of the symptoms, the rather dissimilar physiognomy of the psychic component and the favorable or else rapidly fatal outcome. In the second case we have a clinical picture which resembles to a remarkable degree the classic examples of athetosis. It remains to be seen, however, whether such syndromes, choreoathetoid and choreopsychotic, apparently transitory or recoverable, do not recur, and whether those which fail to clear up are not eventually transformed into perfectly typical instances of the characteristic neurologic affections which they already so closely imitate.

At any rate the association of slight hemiparesis, dysarthria and disorders of emotional control with the choreo-athetoid manifestations justifies the assumption that the lesions border on the internal capsule, the absence of objective sensory losses and hemianopsia largely warrants the elimination of serious thalamic involvement and in this way

14. Marie and Lhermitte: Les lésions de la chorée chronique progressive, Ann. de méd., No. 1, 18, 1914.

an intralenticular or paralenticular localization asserts itself as the probable underlying cause of the spasmodic choreiform and athetoid disturbances. Thus, the pathology of epidemic encephalitis serves to confirm in a certain measure the actually favored hypothesis regarding the striatal origin of choreic and athetoid spasms. Similarly, a predominating implication of the meninges and cortex of the frontal regions is believed to be responsible for the psychotic forms of epidemic encephalitis as well as for the psychotic components incorporated in the other clinical types of the disease, whether of the choreopsychotic or the usual midbrain type. This supposition is in keeping with the prevailing conception of the physiology and pathology of the cerebral cortex and finds additional confirmation in the strikingly paretic type of mental disturbance observed in Case 6. It has been known for a long time that in general paresis the maximum corticomeningeal changes are distributed over the frontal regions of the cerebral hemispheres.

The occurrence of choreopsychotic and choreo-athetoid syndromes as clinical types or sequelae of epidemic encephalitis, coupled with the positive knowledge of chronic forms of this disease, opens up a wide field for retrospective meditation on the genesis of a number of diseases concerning which we still remain quite ignorant. One would think, in the first place, of the various known diseases which some of the clinical types of epidemic encephalitis more or less completely simulate, i. e., athetosis, paralysis agitans and even Huntington's chorea and Friedreich's ataxia. Despite the fact that both of the latter conditions are regarded as hereditary or familial diseases, absolutely identical clinical complexes are not uncommonly observed in which all evidence of familial character is wanting. Likewise to be mentioned in this connection are multiple sclerosis, hypothalamic and dysglandular syndromes and perhaps even dementia praecox and other psychoses. It is puerile, of course, to suppose that epidemic encephalitis is a new disease; only our knowledge of its epidemic occurrence is new and it is extremely probable that, like poliomyelitis, the disease has existed in sporadic form for centuries. This consideration may be helpful in our retrospective endeavor to supply a logical basis for the development of the various diseases named in the foregoing and which neurologists have been observing for years in more or less fully constituted form but without definitely ascertainable notions regarding the far remote initial disturbances.

A point of particular interest in connection with the symptomatology of epidemic encephalitis is the genesis of the variations in the clinical picture and consequently the mechanism underlying the regional variations in the focal predominance of the lesions. In an article on polio-

myelitis,[15] I have previously expressed the opinion that the localization of organic cerebrospinal disease is not entirely accidental but on the contrary largely conditioned by predisposing functional exhaustion of certain areas or cell groups resulting either from prolonged physiologic hyperactivity or from antedating trauma or peripheral disease affecting the related innervation zones. This assumption implies that the natural defensive reactions at such levels are at low ebb and consequently that the fiber tracts or cell complexes concerned, offering inadequate resistance on the advent of a cerebrospinal infectious invasion, succumb first and most severely. The resulting clinical manifestation may be either paralytic or irritative according to the level at which the neuron is disabled and according to the character of the lesion as well as to the degree of involvement. This conception may not have the merit of originality and is doubtless shared by many others, but it is nevertheless a fact that such an interpretation has sufficient practical significance to warrant greater emphasis than it actually receives either in standard textbooks or in current literature. A case in point is supplied by the observation of a patient recently examined who presented a poliomyelitic type of epidemic encephalitis.

The case was that of a woman employed in a department store, who was constantly called on to lay on the counters merchandise stored away in a cellar. Several times a day she was obliged to lift or pull up a trap door in order to get the merchandise. March 20, 1920, she developed general pains, fever of mild degree, unusual somnolence and within a period of forty-eight hours there appeared a paralysis of the right upper extremity. When seen, April 2, it was found that the paralysis was not total, involved particularly the deltoid, spinati and pectoralis major and to a lesser extent the brachialis anticus, biceps, and supinators. The paralysis was atonic with much weakened tendon reflexes in the arm and poor responses to the faradic current. The right lower extremity was somewhat rigid and exhibited increased tendon jerks. This was clearly due to a lesion in the anterior horn of the cord at the level of the fifth and sixth cervical segments with infiltration of the outlying lateral column. When seen again, May 5, all that remained of these symptoms was a much weakened grasp and inability to abduct and elevate the arm much above the horizontal.

Cases possessing similar demonstrative value have been frequently observed. Bassoe[9] recently reported a case illustrating the "meningoradicular" type of encephalitis in which a right sided facial paralysis of the peripheral type was noted in a patient who had had a facial paralysis on the same side three years before. In the present series of cases it is not particularly difficult to establish the etiologic relationship of occupational strain to the salient manifestations of the clinical picture. The traveling salesman (Case 1) who constantly

15. Archambault: The Haematogenous Invasion of the Cerebro-Spinal Axis in Poliomyelitis, Alienist and Neurologist **39**:34 (Jan.) 1918.

hurried to make train connections, impatiently stepped back and forth watching out for late arrivals, indulged at all times in hasty conversation and strove invariably to present a cheerful and winning countenance to all, developed restless movements in the legs, dysarthria and facial contortions suggestive of efforts at distant accommodation. The cigarmaker (Case 2), who spent the major portion of each day seated with his fellow workers at a long table and who constantly turned his head to the right and to the left in conversing with his companions while busily engaged in trimming and rolling tobacco leaf, developed alternating flexor and extensor athetoid movements of the head and choreo-athetoid movements in the right forearm and hand. Regarding the patient figuring as Case 3, relevant muscular strain was apparently not concerned in the genesis of the spasmodic disorder, but, as was previously stated, the woman had had chorea several years before. The psychotic cases with one exception were observed in highly neurotic individuals of Jewish or Latin extraction who were known to have persistently worked either under considerable mental strain or overtime with altogether insufficient sleep and little opportunity for relaxation. That all of these patients continued during their illness the psychic labor associated with their usual activities was plainly revealed by the content of their hallucinations and delusions. With these several recent observations at hand and many analogous experiences in the past, one cannot help ascribing to this same factor of functional hyperactivity and focal exhaustion the preponderant involvement of the mesencephalon in epidemic encephalitis and the resulting frequency of lethargy and oculomotor paralysis. Probably never before have people slept as little and used their eyes as much as they have within the last five years. While the soldiers in the trenches were constantly on the lookout for bombs, shells and missiles of all kinds as well as for airplanes and advancing enemy detachments, the people at home hardly made a less heavy demand on the ocular musculature in persistently working overtime at the various tasks and industries directly related to the pursuit of the war. Never before have people in all walks of life so diligently read the morning and evening dailies, so frequently riveted their upturned eyes on war bulletins, so eagerly watched the evolutions of high soaring planes or so patiently stood before public buildings straining neck and eyes to get a glimpse of distinguished visitors and returning heroes. Let us now add to all this the very significant part played by motion picture theaters which are steadily cropping up everywhere in greater numbers and drawing ever increasing throngs. It is not that any one of these factors in itself has exerted a prejudicial influence but the combination of all of them operating over a protracted period has certainly implied fairly sustained hyperfunction of the motor nuclei of the midbrain

and it is no exaggeration to state that at no time in the history of the human race have the accommodation mechanism and the associated movements of the eyeballs been brought more actively and persistently into play. It has been definitely shown that among the ocular symptoms of epidemic encephalitis by far the most common disturbances have been represented by ptosis, weakness of convergence with paralysis of accommodation and paresis of the associated movements of the eyeballs, more particularly of vertical excursion. Is it not infinitely more logical to interpret such distinctive ocular palsies as the outcome of the selective muscle strain emphasized in the foregoing than to attribute them to a supposed specific affinity of the encephalitis virus for the ganglionic complexes of the mesencephalon?

CONCLUSIONS

1. Epidemic encephalitis is characterized by a remarkably protean symptomatology dependent on regional variations in the focal predominance of the underlying histologic changes.

2. Aside from the usual and familiar clinical picture of midbrain involvement, the disease may yield a number of clinical types closely resembling several well-known affections of the nervous system such as paralysis agitans, poliomyelitis, polyneuritis, cerebellar sclerosis, etc. The combination of choreiform twitchings and acute psychotic disturbance as the salient manifestations is not uncommon and choreoathetoid or frankly athetoid syndromes may be observed as sequela of the disease.

3. The occurrence of a chronic or relapsing form of epidemic encephalitis may prove to have an important bearing on the origin of some of the affections which the clinical types of the disease simulate and of other ill understood conditions such as multiple sclerosis, dysglandular syndromes and certain psychoses.

4. Variations in the symptomatology of epidemic encephalitis are possibly due to individual variations in the relative susceptibility of different levels of the cerebrospinal axis and it is believed that regional exhaustion resulting from prolonged physiologic hyperactivity or from previous disease is an important factor in the localization of the lesions produced by infectious invasions of the central nervous system.

COMPULSION NEUROSIS IN A CHILD

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The following case of compulsion neurosis is related because of its occurrence in a child. At this period of life the most common of the psychoneuroses is anxiety, the primary cause of which is thought to be essentially physical. Where psychogenic causes are most operative in the formation of the neuroses, manifestations of these are rarely seen in childhood. The cerebration requisite for their formation is not ordinarily present at an early age; but when a neurosis does develop, the same psychogenic factors are as potent here as in the adult. This is well shown in the analysis by Freud of "Little Hans"[1] and in Jung's analysis of "Anna."[2] These cases are not compulsion neuroses, but their psychoneurotic symptoms have a basis similar to that present in the case reported.

REPORT OF CASE

Present Illness.—Jennie S. (No. 27390), aged 6 years, was brought to the Neurological Department of the Vanderbilt Clinic on Feb. 21, 1920, by her mother, who stated that she had noticed nothing abnormal in the child until Jan. 2, 1920. At this time she began to act peculiarly and said that she had pieces of glass in her mouth and in her hands. She cried and could not be reassured. Later she feared her hands were dirty and washed them every few minutes. She was afraid to touch any other child, and when her hand was touched she ran quickly to the sink to cleanse it. She also would not allow any one to touch her parents, and if they were touched she attempted to brush their clothes. On one occasion she would not touch a schoolmate, giving as the reason that she was afraid of her because the latter was near a hearse. She would not play with the other children of the neighborhood as she formerly had. One night she awoke crying and said to her father, "I think you are going to die." She seemed to be afraid to be with any one but her parents. The father, who accompanied the patient one week later, stated that on Feb. 20, 1920, she said (in Yiddish), "Papa, my bundle (vulva) is turning this way and that." She indicated the motion by pronation and supination of the right hand. Her father prohibited her from saying such "dirty things" and added, "It does not turn in a child," to which she answered, "Maybe yes and maybe not." One day later she came from school saying, "A boy touched my bundle." When castigated by her parents she said, "He nearly touched it." She perseverated such statements many times and later was also given to verbigeration; the exact words or phrases could not be

1. Freud, S.: Analyse der Phobie eines 5jahrigen Knaben, Sammlung kleiner Schriften zur Neurosenlehre, Series 3, Leipzig and Wien., Franz Deuticke, 1913.

2. Jung, C. J.: Ueber Konflikte der Kindlichen Seele, Jahrb. d. psychoan. u. psychopath. Forsch., 2:33, 1910. Trans. by C. E. Long: Analytical Psychology, New York, Moffat Yard & Co., 1916, Chap. 2, Lect. 3.

obtained from the parents. The patient lately complained of pains in her head and arms, and also that her right leg "was turning." At times she complained of itching and was frequently observed scratching her back, legs and vulva.

Personal History.—The patient was born in Brooklyn. Delivery was instrumental after two days' labor; there were no injuries. At birth she had one tooth and two erupted soon after. She walked and talked at the age of 1 year. At 2 she had otitis media, and paracentesis of the drum was performed. At 4 years she had pertussis. Her habits as to appetite, thirst, bowels, urination and sleep were normal. She had no pavor nocturnus, nocturnal enuresis, thumb sucking or nail biting. Sexual proclivities were denied, with the exception of those mentioned above. She began school Jan. 2, 1920, in the kindergarten and seemed to make normal progress until the last few weeks.

Family and Social History.—The parents were Russian Hebrews, who had been in this country ten years; they were healthy and not neurotic. The father was 31 and the mother 26; they had been married seven years and patient was the only child. Mental and nervous diseases were denied in both ancestral branches. The parents' education was meager; they were of the working class. The father was a tailor and maintained a comfortable home. The patient shared the bedroom with her parents, and though she usually slept alone she was frequently taken into her parents' bed. She was very much pampered by her father, while the mother was the disciplinarian and appeared to be constantly on guard to correct her in brusque fashion even in the presence of strangers.

Mental Status.—On entering the examining room the patient hugged her mother closely, but she readily approached the examiner when he called her. She smiled good naturedly and though reticent at first, she was soon ready to engage in conversation. She cooperated well except that when she was undressed for the physical examination she showed resistance. Her mood was euphoric and playful. Her only mannerism was biting her upper lip continually. Her production was somewhat incoherent, at times irrelevant. For the most part she showed no hesitancy when speaking on neutral subjects, but there was marked blocking when her difficulties were broached. She stated that once while playing with glass lottos she took one into her mouth and grated her teeth on it. Later she believed that she had some chips of glass in her mouth and asked her parents to look for glass in her mouth. She cried because she feared she swallowed some glass. She denied ever having had any pains but, pointing to her forehead, she said, "At one time it turned." She talks as follows about her friends: "Eddie W. (does not give surname) chases all the girls. . . . I don't like him because he pushes the chairs all the time . . . the girls do it sometimes. When the teacher tells some boys to move the tables he says 'I'll move the tables.' Once a boy and girl were sitting and he runs like a horse and throws me down. He is so strong just like a horse." Here, in a whisper, she tells her mother that her teacher is married and asks if she can relate it. Her mother gruffly said "no," and though the examiner tried to prevail on the patient to talk, she refused to do so. About Eddie touching her she said, "I don't want to tell . . . because I am ashamed . . . I don't want to talk no dirty words." When asked why she talks to her parents about it she said "Because I am crazy . . . my mother told me so." She was oriented in all fields; no hallucinations or delusions could be elicited. In the Binet-Simon test she measured up to 7 years. For the association test stimulus words were selected from her production and neutral words were interspersed. To the neutral words

her average reaction time was 2 seconds. The striking fact was the number of times she reacted with numerals, which was out of proportion to all her other reactions. Some of her associations are reproduced:

Stimulus Word	*Reaction*	*Time, Seconds*	*Reproduction*
die	I don't know	7	two
strong	to move tables . . . three	8.5	four cents
glass	tooth brush	6	three pieces of glass
Jennie	one	4	papa

Further associations were:

Three pieces of glass: Swallowed a piece of glass. . . . I don't know anything about it. . . . It is what we drink. . . . Glass is ten. . . . I count one, two three. . . I drink then eat breakfast then go to school. . . . After I get up from bed I make one and two. . . . One is better.

Strong: Eddie moves the tables. . . . He is strong. . . . He goes one, two, three (here she laughs and refuses to continue).

Physical Status.—She was a well developed and well nourished child of 6 years. No abnormalities were noted in the voluntary motor system. Gait, coordination tests and speech were normal. No tremor or choreiform movements were present. The reflexes present and normal. The pupils reacted to light and accommodation. There were no anomalies in the hair distribution and nails. There were no vasomotor disturbances except occasional cold hands. The heart and lungs were negative. There was an eczematous eruption on the hands. No serologic tests were performed. The glandular system was apparently normal.

Summary.—The patient, an only child, soon after she began school, developed queer actions which alarmed her parents She kept continually washing her hands, repeating words and phrases and expressing fears that she swallowed some glass, that she would burn and that her parents would die. She did not allow herself or her parents to be touched. She also complained of pains, headaches and turning movements of various regions of her body. Her conduct with her playmates changed; she was not as playful and at school she frequently was unmanageable. Physically she was normal. Mental examination showed nothing of a psychotic nature. Intellectually she was normal, as shown by psychometric tests.

The symptoms were those of phobias, compulsions and to some degree embraced arithmomania (impulse to count) and onomatomania (obsessions of a word, repeating). These may be grouped under our conception of compulsion neurosis. The various physical complaints belong to the syndrome of anxiety hysteria.

MECHANISM OF NEUROSES IN GENERAL

The first step in the understanding of obsessional or compulsion neuroses is the realization that the symptoms result from the activity of certain unconscious mental processes, the knowledge of which as given us by Freud has illuminated the entire field of the psychoneuroses. No mental phenomenon is fortuitous and each symptom is the result of a conflict between a wish which strives to find expression in consciousness and a force which represses it and even keeps back all knowledge of it. The conflict results in a compromise, and the wish comes to con-

sciousness disguised by distortion. It then converts itself into a physical symptom (hysteria) or is transferred to an indifferent idea (obsession and compulsion). The latter method of the utilization of the affect is usually an adult mechanism.

DEVELOPMENT AND MEANING OF THIS COMPULSION

Because the patient was an only child,[3] she did not have the opportunity to give and take emotions in normal measure. Her love life of necessity was directed mainly to herself and to her father, who was the more congenial of the parents. Her adjustment in her home life was fairly adequate, but as soon as new elements were added, such as beginning school and thereby being in an environment less friendly where she also met the competition of equals and the erotic aims of other children, a readjustment became necessary. For this readjustment she was not properly prepared. She then reverted to autoeroticism, which may have been enhanced by one of the boys touching her. At first she only talked about this freely and touched her genitals without restraint. This practice she was forced to repress (by her parents), but the affect was utilized by conversion on the psychic level and the negation of her practice manifested itself. She washed her hands frequently and feared to have any one touch her which, by generalization, included also her parents. Her compulsion alarmed her parents and the ever watchful mother suppressed this manifestation. Another channel of expression became evident in physical symptoms, such as her forehead "turning." This was accomplished by displacement from below upward. That the "glass swallowing" obsession had a similar origin can be inferred from the association test. Numbers here were traceable to urination and bowel movements which, according to nursery ethics, she was taught to designate as "one" and "two," respectively. Certainly the affect displayed when she said, "Eddie goes one, two, three" can be explained only by the erotic significance with which she endowed the numerals. It is a common mechanism to convert the libido to abstract or foreign objects, such as numbers and glass. It may be suggested also that her associations for the stimulus word "Jennie" which were "one" and "papa" may be significant of the relationship which she wished to establish between herself and her father through the medium of "one" the symbolic value of which we are now aware. This she partly accomplished when she evinced that great interest in her genitals when in her father's presence, but when this was interfered with the neurosis resulted. By this means she accomplished her aim in a negative man-

3. Brill, A. A.: Psychanalysis, Its Theories and Practical Application, Philadelphia, W. B. Saunders Company, 1914, p. 279.

ner and also avenged her liberty of expression which was subdued by her parents. Her protest against the censorship of her pleasure became evident through the phobia that her parents might die which was the negation of a wish that they should thus be punished, an example of the omnipotence of thoughts in children and frequently found in fairy tales, where by mere wishing all may be attained.[4] In compulsive fear the wish energy is transformed into anxiety.

Treatment was conducted along mental hygienic lines as indicated in the anamnesis and by the analysis. Six months later the parents reported that the patient had fully recovered.

CONCLUSION

Only the salient features in the analysis of this case are reported, but the few points brought out throw some light on the nature of this neurosis, which is of rare occurrence in children. This neurosis is the result of a readjustment for which the patient was not adequately prepared. The compulsion symptoms are negation acts of activities which she was forced to give up. The symptoms have as their purpose the denial of the facts, and the denial symptoms (hand washing, displacement from vulva to mouth, etc.) thus utilize the affect which needed some such disposition when once displaced from its original source.

In conclusion I want to express my thanks to Prof. Oliver S. Strong for referring the patient to me, and to Prof. L. Casamajor for the opportunity to study this case and for his helpful suggestions.

Hotel Grenoble, Fifty-Sixth Street and Seventh Avenue.

4. Ferenczi, S.: Contributions to Psychoanalysis, Trans. by E. Jones, Boston, R. G. Badger, 1916.

EXTRACRANIAL INJURIES OF MULTIPLE CRANIAL NERVES *

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Simultaneous lesions of the ninth, tenth and eleventh cranial nerves have frequently been observed as the result of war injuries. Often an injury of one or more additional nerves has been present (most frequently the twelfth), occasionally the cervical sympathetic and rarely the seventh nerve.

Extracranial lesions of the last four cranial nerves had rarely been observed prior to the war. Such cases were attributed either to compression by a tumor, gumma, or tuberculous gland; or to an inflammatory condition. One of the most striking examples of such a case was reported by Beck and Hassin.[1]

Lesions of the ninth, tenth and eleventh cranial nerves were more frequently noted as the result of nontraumatic causes acting about the jugular foramen. Vernet[2] has described six such cases due to compression, of which two were observed by him, and three as the result of inflammation, two of which were his own cases.

The cases presenting lesions of several or all of the last four cranial nerves have been classified on the basis of symptoms added to a pure laryngeal hemiplegia. Thus the syndrome of Avellis[3] consists of a unilateral paralysis of the soft palate, in addition to the larynx, as the result of a lesion of the pneumogastric and the internal branch of the spinal accessory nerves. The syndrome of Schmidt[4] is characterized, in addition to the foregoing symptoms, by paralysis of the sternocleidomastoid and the trapezius through the inclusion in the lesion of the external branch of the spinal accessory nerve. The syndrome of Jackson[5] includes, in addition to all of these symptoms, unilateral paralysis of the tongue resulting from a lesion of the hypoglossal nerve.

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* Read at the Forty-Sixth Annual Meeting of the American Neurological Association, New York, June 2, 1920.

1. Beck and Hassin: Med. Rec., Aug. 21, 1915.
2. Vernet: Rev. neurol. **25**:117 (Nov.-Dec.) 1918.
3. Avellis: Berl. Klinik, No. 41, 1891.
4. Schmidt: Quoted by Vernet, Footnote 2.
5. Jackson: Lancet **1**:689, 1886.

Several new groups have been added by the literature of the war. Vernet [2] has described a syndrome due to a combined lesion of the glossopharyngeal, pneumogastric and spinal accessory nerves, called by him the syndrome of the posterior lacerated foramen. Collet [6] described a combination of symptoms due to a complete lesion of the ninth, tenth, eleventh and twelfth cranial nerves under the name of glossolaryngoscapulopharyngeal hemiplegia. The same condition was described by Vernet [7] as the complete syndrome of the last four cranial nerves, and by Sicard [8] as the syndrome of the condyloposterior lacerated foramen. Villaret [9] described the syndrome of the posterior retroparatoid space, which is characterized by the addition of a lesion of the sympathetic nerve to the syndrome of the last four cranial nerves, producing thereby enophthalmos, narrowing of the palpebral fissure and myosis.

The number of syndromes is limited only by the possible combinations of complete or incomplete paralyses of these several cranial nerves, and the descriptive ability of the various observers.

One of the notable features of all the cases is that whatever other nerves might be affected the ninth, tenth and eleventh are rather consistently injured together. Such lesions are produced by wounds in the uppermost part of the lateropharyngeal space. This space is bounded above by the base of the skull in the region of the jugular foramen. The jugular foramen or posterior lacerated foramen is an opening of irregular shape and size, placed between the petrous portion of the temporal bone in front and the jugular process of the occipital bone behind. The foramen is occasionally divided into two parts by the spicules of bone which bridge it. It presents three compartments. Through the anterior compartment passes the inferior petrosal sinus; through the posterior the internal jugular vein and some meningeal branches from the occipital and ascending pharyngeal arteries; and between the two veins, in order from before backward, are the glossopharyngeal, pneumogastric and spinal accessory nerves (Fig. 1).

At its exit from the jugular foramen the jugular vein lies to the outside of the nerves; closely in front and internally lie the internal carotid artery and the accompanying sympathetic nerves (Figs. 2 and 3). At this point, Vernet states, it is possible for a projectile passing obliquely from the mastoid region on one side to the malar bone on the other to injure the three nerves and miss both the carotid and jugular vessels. This was usually the direction of the course of the

6. Collet: Lyon méd., May, 1916, p. 121.
7. Vernet: Paris méd. 7:78 (Jan. 27) 1917.
8. Sicard: Marseille méd., March, 1917.
9. Villaret: Paris méd., January, 1917, No. 4, p. 78.

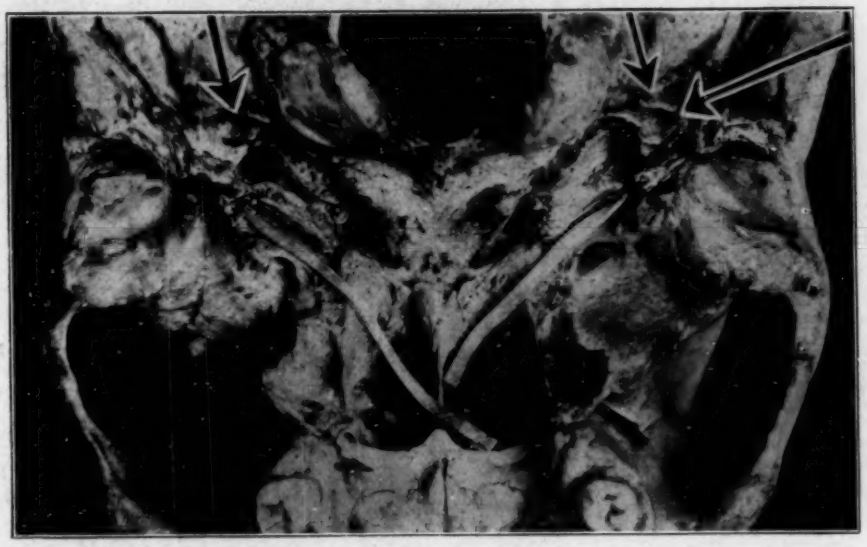

Fig. 1.—Base of skull. Arrows point to jugular fossa.

Fig. 2.—Photograph of model showing extracranial course of last four cranial nerves. The spinal portion of the spinal accessory nerve is indicated by —, the hypoglossal by ═, the vagus by ≡, the glossopharyngeal by ≡.

missile in the cases under observation. In many cases, however, such a route was not followed. The fact that such patients survived the injury, which produced a paralysis of the three cranial nerves, without a contralateral hemiplegia, indicates one of two conditions: either severe injuries to the carotid and jugular vessels need not be fatal or result in a contralateral hemiplegia, or these cranial nerves may sustain severe traumatic lesions without injury of the carotid and jugular vessels. Studies of trauma of peripheral nerves have shown us that rarely does it produce anatomic section. Contusion, concussion, pressure by hematomas and arterial and arteriovenous aneurysms may likewise produce loss of function of cranial nerves.

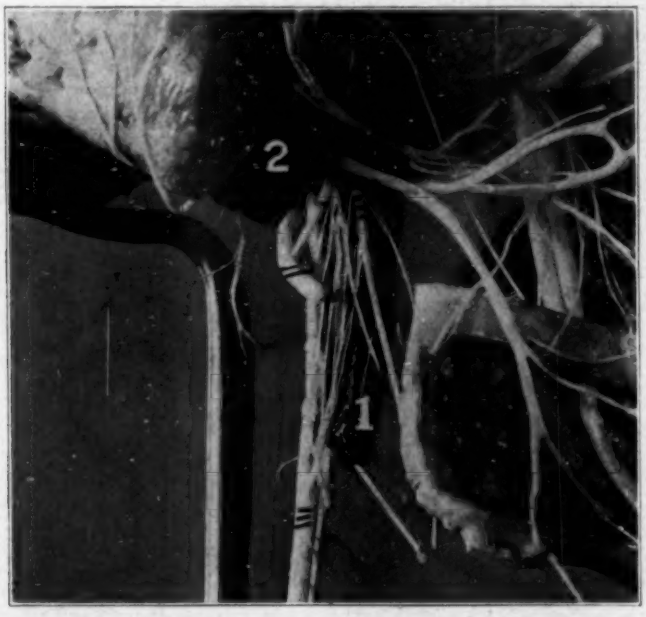

Fig. 3.—Photograph of model showing extracranial course of last four cranial nerves. The spinal accessory nerve is indicated by —, the hypoglossal by ═, the vagus by ≡, the glossopharyngeal by ≡, the carotid artery by 1, the jugular vein by 2.

In certain respects, injury of the last four cranial nerves resembles injury of the brachial plexus. As a complete brachial palsy which immediately follows injury of the plexus gradually improves until only one or more of the cords are permanently paralyzed, so complete paralysis of the last four cranial nerves frequently eventuates in a permanent paralysis of only one, with partial lesion of one or more of the others.

In their peripheral course, the last four cranial nerves are in close proximity to a point a little below the level of the tip of the

mastoid. Thus lesions of the ninth, tenth and eleventh cranial nerves have been caused at times by an injury not directly acting on the posterior lacerated foramen.

Whether cranial nerves other than the ninth, tenth, and eleventh are injured depends on the direction and the level of the course of

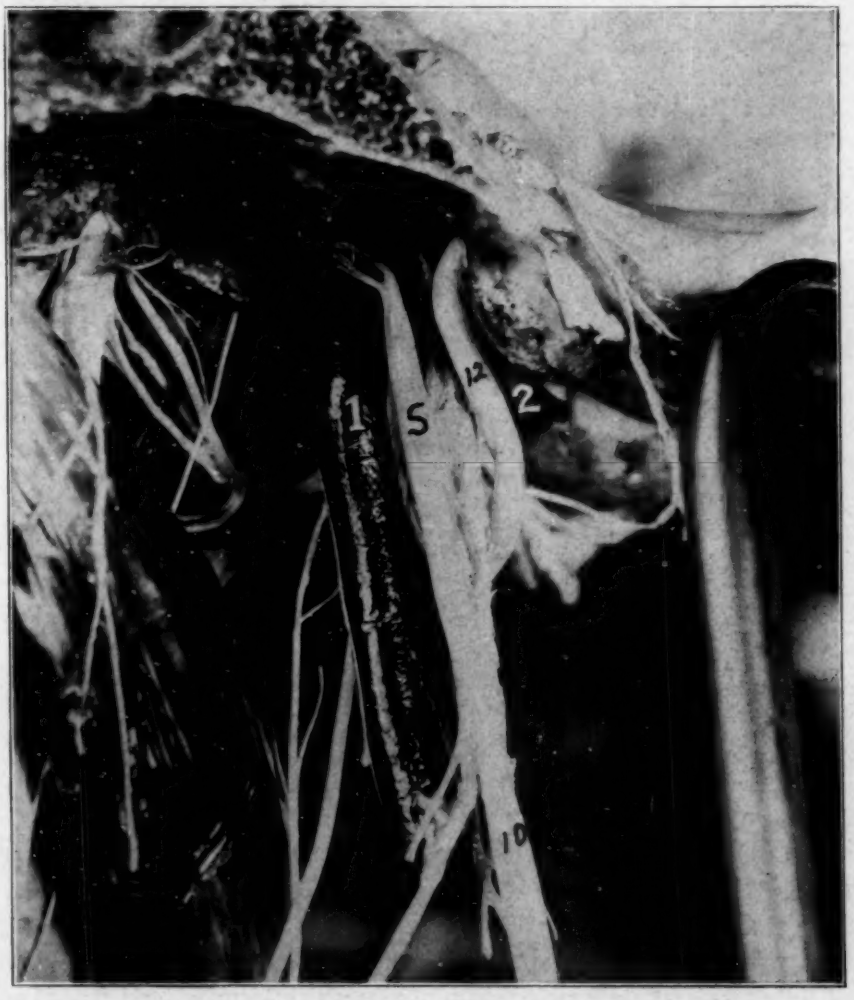

Fig. 4.—The relation of the hypoglossal (12) and sympathetic (*S*) nerves to the vagus (10); 1 indicates the carotid artery; 2, the jugular vein.

the projectile. The frequent inclusion of the hypoglossal nerve in these injuries is easily understood when we recall the proximity of its exit, the anterior condyloid foramen, to the jugular foramen. Likewise it is in close proximity to the ninth, tenth and eleventh

cranial nerves in the retroparotid space where its injury is frequently associated with a lesion of the sympathetic nerve. This space is described by Villaret as being bounded posteriorly by the cervical spine, internally by the pharynx, anteriorly by the internal prolongation of the parotid gland and the muscular bundle attached to the styloid process, and above by the base of the skull in the region of the jugular foramen (Fig. 4).

The symptomatology of a combined lesion of the ninth, tenth and eleventh cranial nerves is constant and easily recognized. As a characteristic triad of symptoms indicative of a complete lesion of these three nerves, Vernet proposes nasal regurgitation of fluids, dysphagia of solids and hoarseness, representing respectively paralysis of the palate, pharynx and larynx. What part of the collective symptomatology may be attributed to any one of these nerves is more difficult to interpret.

Considerable confusion exists concerning innervation of the soft palate and larynx. The specific functions of the accessory portion of the spinal accessory and the pneumogastric nerves are undetermined. Whether it would be more profitable to consider their functions together as those of the vagospinal nerves remains to be seen.

The glossopharyngeal nerve, according to Vernet, innervates the superior constrictor of the pharynx. Loss of its function results in difficulty in swallowing solids. In lesions of this nerve, the posterior wall of the pharynx deviates to the unaffected side when the patient says "ah" with the tongue pulled forward, and there is disturbance of taste in the posterior third of the tongue.

A lesion of the pneumogastric produces sensory loss on the soft palate and the posterior wall of the pharynx in addition to the well recognized disturbances of secretion (salivation) and of respiration (dyspnea or pseudo-asthma). Injury of the accessory portion of the spinal accessory nerve causes paralysis of the soft palate and larynx as well as a rapid pulse, while a lesion of the spinal portion produces paralysis of the sternocleidomastoid and trapezius muscles.

I have observed five cases of multiple lesions of the last four cranial nerves; of these the records of only three are available. Unfortunately, owing to the pressure of work and the conditions of military practice, they are not as complete as one would desire.

REPORT OF CASES

CASE 1.—S. R. was wounded Aug. 10, 1918, by a machine-gun bullet, the wound of entrance being 1½ inches to the left of the fourth cervical spine, and the wound of exit half an inch below the anterior extremity of the left zygomatic arch. He was unconscious for half an hour, and when attended by

a medical officer one and one-half hours following the injury he was hoarse, had difficulty in swallowing, marked salivation and dyspnea.

I examined him ten days after injury. There was a subconjunctival hemorrhage of the left eye. A hemorrhage into the mucous membrane of the posterior wall of the pharynx extended well up into the nasopharynx and down into the mouth of the esophagus. There were present a peripheral paresis of the left seventh nerve and paralysis of the ninth nerve. He had considerable difficulty in swallowing solid food. The posterior wall of the pharynx was pulled toward the right, especially when the tongue was pulled forward. No disturbance of taste could be demonstrated.

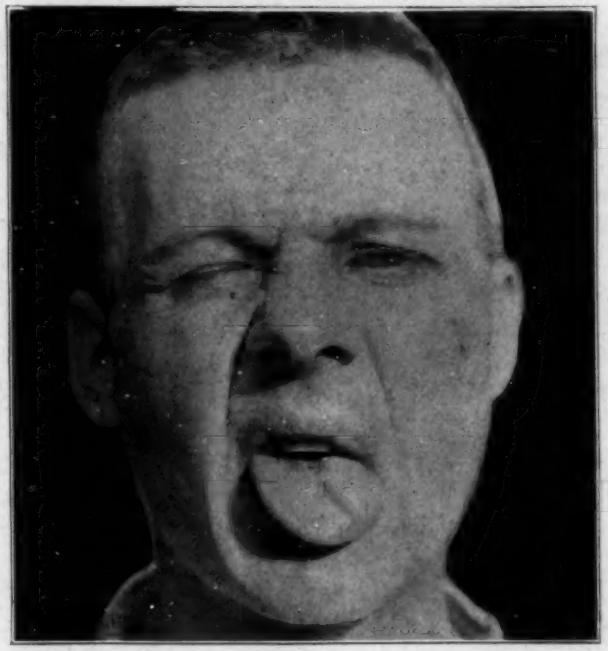

Fig. 5.—Hypoglossal palsy and difference in facial innervation.

There was paralysis of the vagospinal nerves, that is, of the accessory portion of the spinal accessory and the vagus. He had moderate salivation and sensation over the left side of the soft palate was diminished. No disturbance of respiration was noted. There was paralysis of the left side of the soft palate. The latter was pulled to the right, and in phonation this deviation was increased. There was some regurgitation of fluids. The gag reflex was absent on the left. The left vocal cord was paralyzed and the voice hoarse and nasal.

There was paralysis of the sternocleidomastoid and the trapezius. On turning the head to the right only a small portion of the sternal part of the sternocleidomastoid became prominent. The shoulder drooped. The inner angle of the scapula deviated outward, the outer angle dropped and the lower angle approximated the midline and projected under the skin. The left hypoglossal

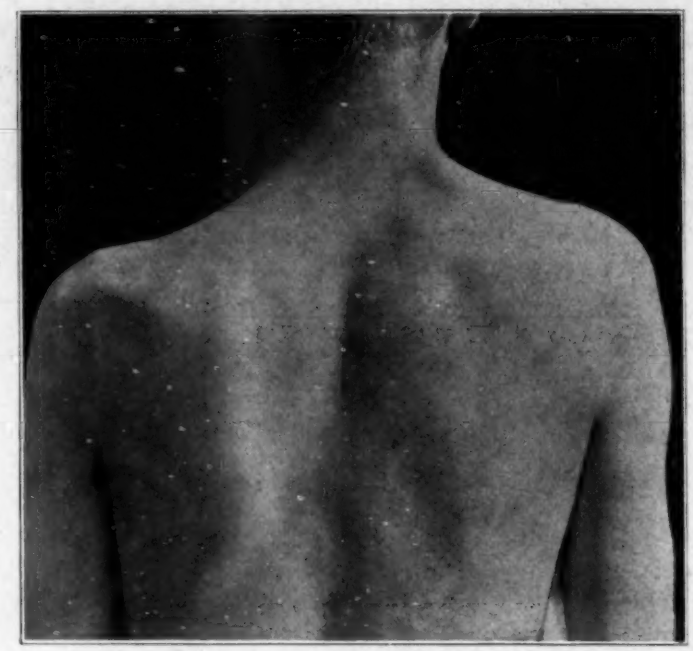

Fig. 6.—Paralysis of trapezius muscle.

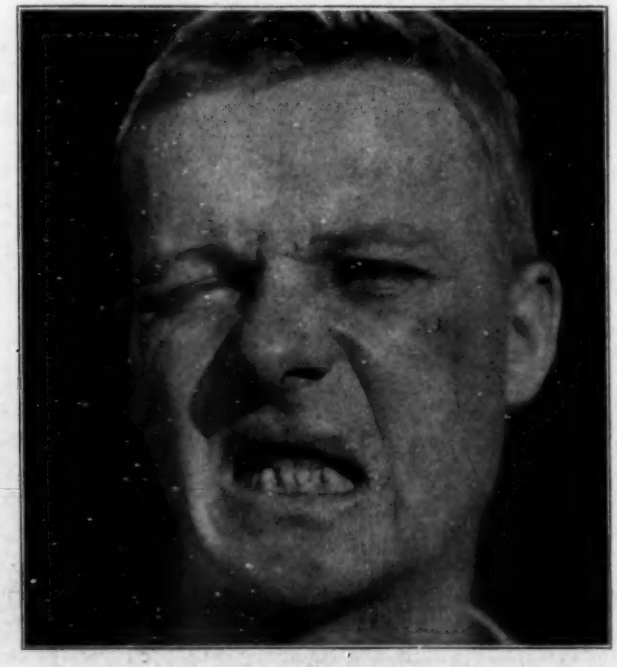

Fig. 7.—Weakness of left facial nerve.

nerve was paralyzed. The tongue, while in the buccal cavity, was pulled slightly toward the right; when it was protruded, it deviated to the left and showed atrophy and fibrillary twitching.

In this case we were dealing with an extracranial injury of the ninth, tenth, eleventh and twelfth cranial nerves and a partial lesion of the seventh. The course of the missile did not conform to the usual diagonal route from the mastoid region of one side to the malar of the other (Figs. 5, 6 and 7).

CASE 2.—H. P. was wounded April 5, 1918, by a pistol bullet, the wound of entrance being just above the upper central incisors, and the wound of exit 1 inch below and 2 inches behind the right mastoid process. For several days following the injury he was unable to move his left arm and leg. He

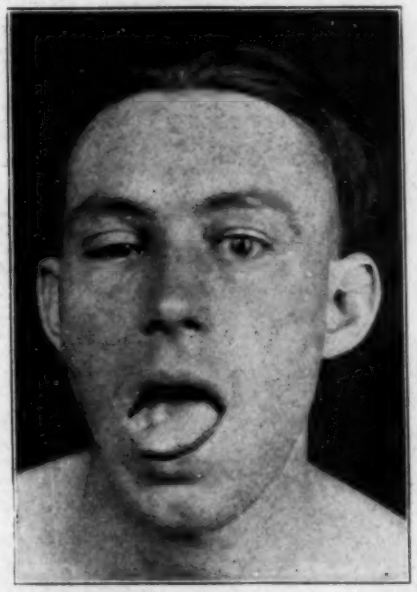

Fig. 8.—Hypoglossal palsy and narrowing of palpebral fissure, enophthalmos and myosis.

had difficulty in speaking, hoarseness, and slight regurgitation of liquids. He preferred semisolid food, as solid food was hard to swallow.

I examined him over a year after the injury. The deep reflexes on the left side were all greater than on the right; the plantars were equal and normal, the cremasteric equal, and the left upper abdominal reflex was diminished. There were no sensory disturbances over the extremities, trunk or abdomen, and no weakness in these regions was noted. It is probable that he sustained a unilateral concussion of the spinal cord at the time of injury.

A lesion of the cervical sympathetic of the left side was shown by enophthalmos, diminution in the size of the palpebral fissure and a contracted pupil. Indicating a lesion of the ninth nerve was a history of dysphagia for solids, and slight deviation of the posterior wall of the pharynx to the left on protruding the tongue. Taste was not affected.

Of the vagospinal nerves it may be said that there was a history of regurgitation of fluids and hoarseness but no history of disturbance of respiration, pulse and salivation, and no change was found.

In the distribution of the spinal portion of the spinal accessory there was found slight atrophy of the trapezius muscle, none of the sternocleidomastoid.

The twelfth nerve was paralyzed. The right half of the tongue, with the exception of the inner part of the very tip, was markedly atrophied. Slight paresis of the facial muscles of the right side was seen.

In this case we were dealing with permanent paralysis of the twelfth nerve and the cervical sympathetic, and with a dissociated and recovering lesion of the ninth, tenth and eleventh cranial nerves. In addition, a slight lesion of the seventh nerve was present. This case is illustrative of the retroparotid syndrome of Villaret. Many such cases have been noted, among others

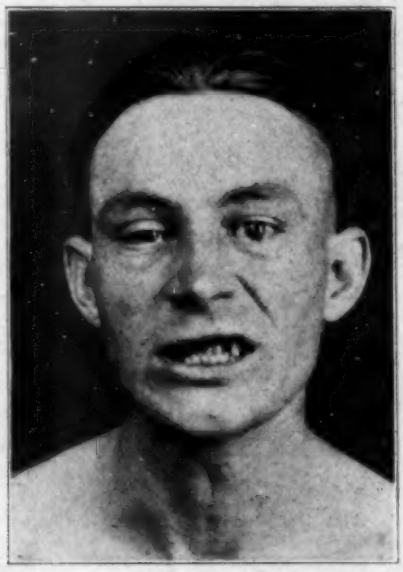

Fig. 9.—Facial nerve weakness and narrowing of palpebral fissure, enophthalmos and myosis.

by Villaret and Faure Beaulieu,[10] Lannois, Saignon and Vernet,[11] Vidoni,[12] Halphen,[13] and Sicard and Roget[14] (Figs. 8 and 9).

Case 3.—C. L. was wounded Oct. 10, 1918, by a high explosive shell, the wound of entrance being at the tip of the left mastoid. The missile was located by roentgenogram in front of the axis in the midline. Following the injury he was unconscious for six hours.

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10. Villaret and Faure-Beaulieu: Presse méd. **26**:591 (Nov. 21) 1918.
11. Lannois, Saignon and Vernet: Quoted by Villaret and Faure-Beaulieu. Footnote 10.
12. Vidoni: Quaderni di Psichiatria **4**: No. 7-8, 1917.
13. Halphen: Reunion médicale de la IV^e^ Armée, June, 1917.
14. Sicard and Roget: Marseille méd. **55**:806 (Oct.) 1918.

I examined him ten days after injury. He showed no paralysis of the extremities, trunk or abdomen. There were no sensory disturbances. No dysmetria, adiadokocinesis or other evidence of dyssynergia was found.

The findings may be divided into two groups: first, paralysis of the left facial and auditory nerves; second, paralysis of the ninth, tenth, eleventh and twelfth cranial nerves of the same side. There were complete peripheral facial palsy of the left side, loss of taste on the whole left side of the tongue and total deafness on the same side. He gave a history of tinnitus and in his record was a notation of gradually diminishing horizontal and lateral nystagmus to the right. I found such a nystagmus of mild degree. There was escape of what appeared to be cerebrospinal fluid from the left ear. Because of this, caloric tests were not performed, and turning tests were omitted because of the general condition of the patient. Roentgenograms did not reveal a basilar skull fracture.

Because the peripheral facial palsy was associated with loss of taste in the anterior two thirds of the tongue, and there was injury to both the cochlear and vestibular portions of the eighth nerve, it was concluded that the injury occurred in the peripheral part of the seventh and eighth nerves within the petrous portion of the temporal bone.

Dyspnea, hoarseness, nasal speech, palatal palsy and anesthesia, and paralysis of the left vocal cord indicated paralysis of the vagospinal nerves, and a complete or severe lesion of the ninth nerve was shown by paralysis of the superior constrictor of the pharynx and loss of taste in the posterior third of the tongue. Involvement of the spinal portion of the eleventh nerve was shown by paralysis of the sternocleidomastoid and trapezius muscles. The left side of the tongue showed fibrillary twitching.

COMMENT

The extracranial origin of the paralyses in Case 3 is not as certain as in the other two because of the involvement of the eighth nerve and the escape of cerebrospinal fluid from the ear. The absence of paralysis and sensory disturbances in the extremities and of cerebellar dysfunction speaks against a central origin. An intracranial but peripheral lesion would require an injury of wide extent, which the roentgenographic examination failed to reveal. The course of the missile was such that it traversed the upper part of the lateropharyngeal space and, on the one hand, could not have avoided injury to at least some of the last four cranial nerves, and on the other, could, and probably did, injure all of them.

The course of the missile in these cases conformed to no rule except to traverse the upper lateropharyngeal space. Whether the carotid artery or the jugular vein was injured could not be ascertained. In all of them the facial nerve was injured, as in the cases of Rimbaut and Vernet,[15] Halphen,[13] and Bourcart, Lannois and Vernet.[16] It is

15. Rimbaut and Vernet: Marseille méd. **55**:887 (Oct.) 1918.

16. Bourcart, Lannois and Vernet: Bull. de Soc. Medico Chirurgical de la xiv, Region, Jan.-June, 1916, p. 67.

probable that many cases of injury of the last four cranial nerves might have been recorded if they had been observed soon after injury, but undoubtedly a number of them recovered, leaving permanent paralysis of only one nerve, as for example, the hypoglossal, and they were misinterpreted when examined some time after injury.

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PUNCTURE OF THE CISTERNA MAGNA*

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A situation occasionally arises in which lumbar puncture is either impossible, impracticable or insufficient, when access to the upper reservoirs of the cerebrospinal fluid are desirable or imperative. The necessity of reaching the subarachnoid space at other points than the lumbar sac has led to such procedures as puncture in the thoracic and cervical regions, puncture through the sphenoidal fissure and intraventricular puncture. In the literature one finds no mention of cisterna puncture[1] as a clinical procedure, although it has for long been the routine method for obtaining cerebrospinal fluid in animals, and drainage of the cisterna has been employed by a number of surgeons.[2]

With other routes besides the lumbar and ventricular, the writer has had no experience, all seeming of too hazardous a nature for other than extremely rare application. Cisterna puncture, reaching as it does "the distributing center of the cerebrospinal fluid system" should, however, render access to a point of even more strategic value than thoracic, cervical or sphenoidal puncture, and should in some cases render intraventricular puncture unnecessary.

TECHNIC

The method of approach to the cisterna cerebello-medullaris (cisterna magna) was published by Wegeforth, Ayer and Essick in 1919[3] after careful preliminary study on the cadaver. In practice the procedure has been found almost always easy, and no alarming symptoms have been observed, either at the time of puncture or subsequently.

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* Read at the Forty-Sixth Annual Meeting of the American Neurological Association, New York, June, 1920.

* From the Departments of Neurology of Harvard Medical School and of Massachusetts General Hospital.

1. Grammatical accuracy should require that we speak of "cisternal puncture" correlative with "lumbar puncture." It seems best, however, to shorten the term, using the noun instead of the adjective, and speak of this procedure as "cisterna (or cistern) puncture."

2. Kopetzky, S. J., and Haynes, I. S.: Meningitis, Cornell Univ. Monograph, 1912.

3. Wegeforth, P., Ayer, J. B., and Essick, C. R.: The Method of Obtaining Cerebrospinal Fluid by Puncture of the Cisterna Magna (Cistern Puncture), Am. J. Med. Sc. **157**:789, 1919.

The patient is placed on the side, as if for lumbar puncture, with neck moderately flexed. Care is taken to maintain the alinement of the vertebral column to prevent scoliosis and torsion, and in cases where comparative pressure readings are important the lumbar and cisterna needles should be on the same horizontal plane. After antiseptic preparation of the skin, usually including the shaving of a little hair, and local anesthetization with procain, the thumb of the left hand is placed on the spine of the axis, and the needle inserted in the midline just above the thumb. The needle may be pushed rapidly through the skin, but should then be cautiously and guardedly forced forward and upward in line with the external auditory meatus and glabella, until the dura is pierced.

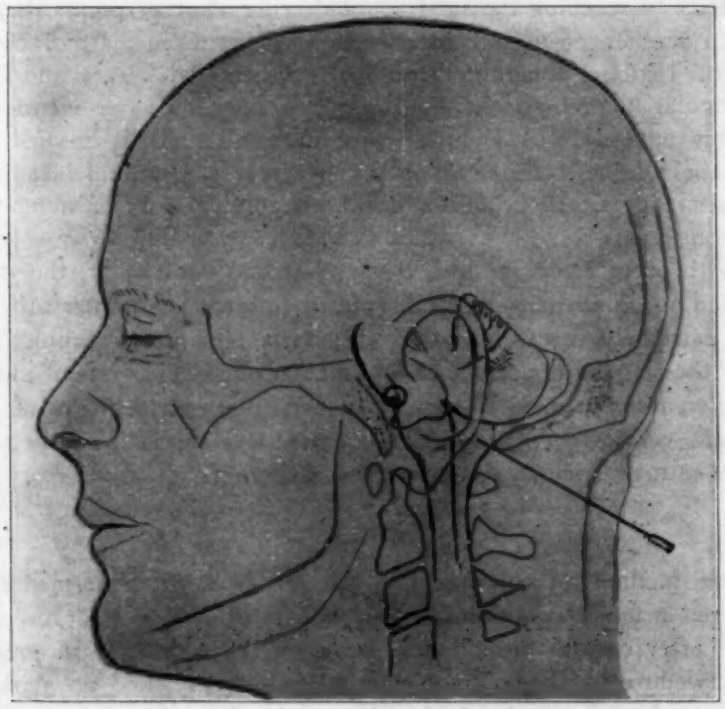

Fig. 1.—Photograph of original tracing from frozen section of head, cut in midsagittal plane. Needle in situ, one-third natural size.

If the cisterna be entered at this angle there is usually a distance of from 2.5 to 3.0 cm. between dura and medulla as shown on frozen sections; with the needle less oblique in position the distance between the walls of the cisterna becomes progressively less. Therefore, it is good practice to aim a little higher than the auditory meatus, and, if the needle strikes the occiput, to depress just enough to pass the dura at its uppermost attachment to the foramen magnum. At its entrance the same sudden "give" is felt as in lumbar puncture (Fig. 1).

The needle employed is a regular lumbar puncture needle, nickeloid, 18 gage preferred, with beveled stylet, sharp on the sides but not too sharply pointed. There is rather less variation in the depth of the tissue traversed than in the lumbar region, being in an ordinary sized adult from 4 to 5 cm., the greatest

distance in the series being 6 cm. and the smallest 3.5 cm. It was found that a faint circular scratch on the needle, 6 cm. from the tip, was entirely satisfactory in judging the distance, and was preferable to the deeper markings of the Patrick needle which tend to make its insertion a little jerky and consequently less guarded.

Discomfort to the patient is usually the same as or less than in lumbar puncture, for with the wider bony opening there is less likelihood of scraping the periosteum than in passing between laminae in the lumbar region. Twice only has there been sudden transient pain on piercing the dura. Failure to reach the cisterna was experienced on two occasions, once in a patient with neck greatly retracted from acute meningitis; and once it was deemed wise to desist on obtaining no fluid at the depth of 6 cm. The after-effects of cisterna puncture have been of no consequence, even when serum has been introduced. Whether puncture headache will follow this technic is not known, as the cases in which it has been carried out were for the most part those which do not contract headache from lumbar puncture. Thus far, however, headache has not been a sequel of cisterna puncture.

The technic should not prove difficult to one familiar with lumbar puncture, especially after preliminary practice on the cadaver. It was noticeable that the apprehension attending the earlier punctures was entirely with the operator, and was not shared by the patient, whose ignorance of the proximity of the medulla served him to advantage. In spite of the simplicity of the technic it would, in the author's opinion, be unfair to the patient to perform cisterna puncture without previous experience at the necropsy table.

CLINICAL APPLICATION OF CISTERNA PUNCTURE

In the previous paper on the technic, cisterna puncture was theoretically recommended in three groups of conditions: (1) in spinal subarachnoid block following meningitis; (2) combined with lumbar puncture for irrigation of the subarachnoid space, and (3) as a route for serum injection in epidemic meningitis.

In the twenty cases in which cisterna puncture has been performed by the author are included examples of the first and third groups. Opportunity for irrigation has not yet been offered. But another field of usefulness for this procedure has been found in the early diagnosis of cord compression.

The clinical experience of the author to date rests on forty-three punctures performed in twenty cases for the following purposes:

For diagnosis or treatment of postmeningitic block in five cases; for treatment in epidemic meningitis in one case; for diagnosis and treatment of cerebral syphilis in five cases, and for diagnosis of cord compression in nine cases.

During the course of study of these cases a number of results were obtained which were apparently entirely negative and which we feel justified in taking as our normal standard. Consideration of these leads us to believe that cistern and lumbar fluids are practically identical, at least so far as protein (quantitatively determined by colorimetric method), sugar (qualitatively estimated), cells, and colloidal gold reactions are concerned. Moreover, the pressures, as registered in two manometers simultaneously, are the same, and the subarachnoid space is shown to be normally a free channel of communication as indicated by an immediate drop in pressure in either manometer when fluid is withdrawn from the other. Oscillations due to pulse and respiration, and changes in pressure from coughing, holding the breath or compression of the jugular veins are normally the same in both loci. The similarity of the fluid at these two points is a fortunate circumstance in that any difference must be explained on a pathologic basis and should be of significance.

I will proceed to the consideration of the four groups of cases for which cisterna puncture, frequently combined with lumbar puncture, was performed.

1. *For Diagnosis or Treatment of Postmeningitic Spinal Subarachnoid Block.*—Especially in neglected cases of meningitis, it is likely that adhesions will form, cutting off communication between different parts of the cerebral and spinal subarachnoid space. Favorite sites for such adhesions have been shown to be about the foramen magnum and in the thoracic meninges. In such cases of spinal meningeal block there should be a difference in the fluid obtained by cisterna and by lumbar puncture.

Five patients with possible postmeningitic block were so examined. In two this diagnosis was confirmed.

Case 1.—Baby G., 10 months old, had had convulsions since the age of 3 months, the cause of which was not apparent. In the hospital he showed unmistakable meningeal symptoms, was evidently partially blind, the optic disks being pale, and was mentally backward. The temperature ran from 99 to 101 F., and there was a moderate leukocytosis. A diagnosis of subacute meningitis was made. Lumbar puncture at one point failed to yield fluid. Puncture in another lumbar space also failed to yield fluid, but on carefully withdrawing the needle with the thumb covering the external end two drops of thin pus were found in its lumen. Cisterna puncture was then performed and 5 c.c. of slightly blood-tinged fluid was obtained under normal pressure (90 mm. of water). The fluid was found to be normal in protein and cells, except for the slight amount of blood present, and free from organisms. Unfortunately no culture was made from the lumbar pus. A diagnosis of spinal subarachnoid block was made, with probable persistent infection of the spinal meninges, but with evidence against residual infection of the cerebral meninges at the base (ventricular infection, localized cortical meningitis and brain abscesses were of course not excluded).

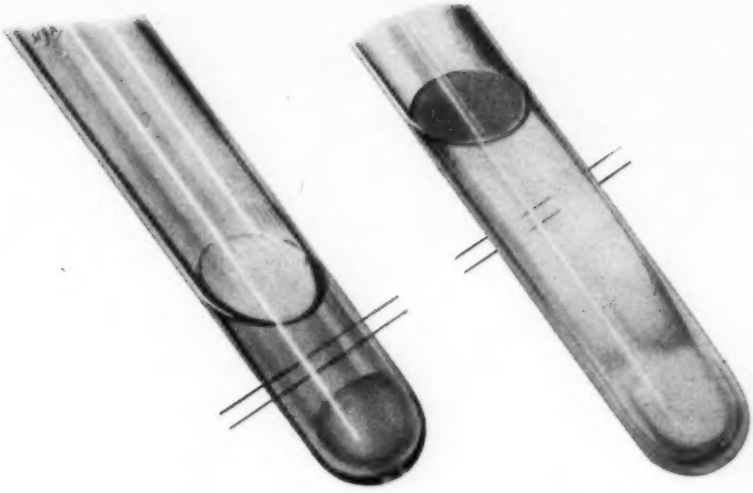

Fig. 2 (Case 2).—Cistern fluid (right) purulent; Staphylococcus aureus. Lumbar fluid (left) clear, showing Froin syndrome of xanthochromia and massive coagulation; no organisms. From a case of postmeningitic spinal subarachnoid block.

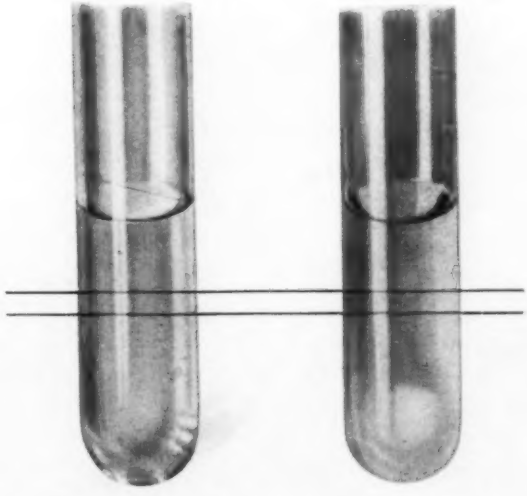

Fig. 3.—Cistern fluid (left) normal. Lumbar fluid (right) Froin syndrome. From a case of compression of spinal cord by dislocation of thoracic vertebra.

Case 2.—Mr. S. was admitted to the Cambridge Hospital, Sept. 20, 1919, on the service of Dr. F. R. Jouett and Dr. J. P. Nelligan, to whom I am indebted for seeing this patient. He had been sick about three weeks and although mentally clear presented unmistakable signs of acute meningitis, with marked head retraction and a positive Kernig reaction, and a temperature of 102 F. He also presented a spastic paraplegia with some atrophy of the legs and thighs, indicative of a diffuse myelitic process. Lumbar puncture yielded only 7 c.c. of clear, yellow fluid which promptly clotted solidly and in which no organisms could be demonstrated on film or culture, and only a rare cell could be found. In fact, the lumbar fluid was typical of the "syndrome of Froin." Cisterna puncture yielded an abundant yellowish white purulent fluid, under high pressure (400+ mm.) containing a large number of cocci, identified on culture as *Staphylococcus aureus* (Fig. 2). The cisterna was washed out with physiologic sodium chlorid solution. On a subsequent occasion the patient's own serum was introduced with the hope that it might contain curative substances. The temperature became normal, and symptoms of acute meningeal irritation gradually subsided; some days later a third cisterna puncture yielded an almost clear fluid, showing few cells and no organisms. On account of persistent high leukocytosis in the blood and a slight degree of optic neuritis it was thought that infection of the ventricles might be present; to settle this point combined cisterna and ventricle punctures were performed; both of these spaces proved to be free from organisms and pus; and incidentally permeability of the velum medullare was established by the ready passage of serum from the ventricle into the cisterna magna. Clinically, this patient began to improve immediately after the first cisterna puncture, the signs of active meningitis rapidly disappearing. The spinal subarachnoid block, however, remained, as shown by persistence of signs of myelitis and inability to obtain more fluid from the lumbar sac.

By means of combined cisterna and lumbar punctures we were able in the first case to demonstrate persistent pus in the spinal meninges, the basal cerebral membranes being presumably free from infection; in the second to demonstrate persistent acute staphylococcus meningitis in the cerebral meninges with spinal meningeal block, and to treat successfully the cerebral infection by way of the cisterna magna.

2. *For Early Treatment in Meningococcus Meningitis.*—Serum treatment has reduced the mortality of epidemic meningitis to approxmately 25 per cent. Why do we continue to lose even one in four cases? A number of reasons may be adduced: The use of a serum that is inactive in a given lethal case; the presence of an organism of especial virulence; the establishment of treatment too late. But a most important reason seems to be that the serum does not reach the earliest pathologic lesions in sufficient concentration. While the exact method and points of entrance of the meningococcus to the meninges are not yet certain there is both clinical and experimental evidence [4] pointing

4. Weed, L., Wegeforth, P., Ayer, J. B., and Felton, L. D.: A Study of Experimental Meningitis, Rockefeller Institute, Monograph Series No. 12, 1920.

toward the cerebral rather than the spinal meninges as the earliest infected. Substances introduced in moderate amounts and under normal pressure into the lumbar subarachnoid space have been repeatedly shown to reach little higher than the base of the brain, and in this series I have been able to confirm this fact, as much as 20 c.c. of serum introduced into the lumbar sac not appearing at the cistern during the period of injection. Similarly, injections of 30 c.c. of India ink into the lumbar sac of a cadaver barely blackens the base of the brain; but when a similar amount is placed in the cisterna magna, not only is the base well blackened, but also the cerebral cortex on both sides. Theoretically then, antimeningococcus serum should be most efficacious in

Fig. 4.—Method of administering serum by cisterna puncture.

early meningitis if given by the cisterna route. Only one patient has been so treated by me and that one not only by the cistern but also by the lumbar and venous routes. In this patient, however, ventricular infection resulted and it was not until the disease was attacked by the ventricular route also that recovery took place. Cisterna injections were employed only three times in this case. It was one of my earliest uses of this method and I admit that my inexperience with the technic, in a case made difficult by head retraction, prevented a persistence which I should not again countenance. The case is mentioned as showing the possibility of administering serum in epidemic meningitis by the cisterna route, which on theoretical grounds might well be the method of choice.

3. *For Diagnosis and Treatment of Syphilis of the Nervous System.*—In four cases of late cerebral syphilis arsphenamized serum (Swift-Ellis technic) has been used. A fifth patient was punctured for diagnosis alone. As much as 20 c.c. of undiluted serum has been employed with no disturbance to the patient at the time of puncture or subsequently. The technic is similar to that used in lumbar injections, special care being taken to alter pressures very slowly (Fig. 4).

Two of the patients treated in this manner suffered from progressive optic atrophy (so-called "primary"), one had bilateral facial pain, resistant to other forms of antisyphilitic treatment, the fourth was a case of general paresis. Needless to say, in all cases the laboratory tests were confirmatory of the diagnoses.

This is not the place to discuss the merits and demerits of serum therapy of neurosyphilis; nor do I believe that any deductions as to the prognosis in any of these cases is justified at this time. However, it may fairly be said that the results to date are sufficiently encouraging to recommend further trial. It may also be definitely stated that in these twenty-one injections in four patients the procedure has been easy of application and somewhat more comfortable for the patient than lumbar injections, and that this technic unquestionably places the serum in greatest concentration in the cerebral meninges.

4. *For Diagnosis of Cord Compression Other than Cases of Postmeningitic Block.*—It is assumed as proved that the cerebrospinal fluid obtained from the lumbar sac passes downward from the cerebral reservoirs of which the cisterna magna is the greatest. We have known for some years that obstruction to this downward flow other than by postmeningitic adhesions will cause certain changes in the fluid below the level of cord compression (syndromes of Froin and Nonne). Moreover, we know from the results of a few operations and from experimental cord compression [5] that the fluids above and below the level of compression are different. These facts, already recognized, led us to use combined cistern and lumbar punctures in the diagnosis of spinal subarachnoid block, in the hope that differences, even slight, in the two fluids would give us information of value. This hope has been realized.

The criteria on which our judgment in such cases is based are two-fold: (1) evidence of mechanical obstruction to the free passage of fluid in the spinal subarachnoid space, as indicated by (*a*) pressure relations in the two loci, especially changes in pressures which result after withdrawal of fluid (Fig. 5), (*b*) variations in the normal

5. Ayer, J. B.: Cerebrospinal Fluid in Experimental Compression of the Spinal Cord, Arch. Neurol. & Psychiat. **2**:158, 1919.

oscillatory movements of the fluid, dependent on the cerebral pulse and respiration, and (*c*) gross changes in fluid pressure caused by compression of the jugular veins, and by coughing, all indicative of mechanical interference with the continuity of the spinal fluid column; (2) evidence of different chemical composition of the two fluids, as shown by comparative protein determinations, variations from the normal supposedly due to alterations in the meninges, allowing increased transudation of protein into the spinal fluid.

While it is certain that tumors and other lesions which compress the spinal cord frequently cause isolated protein increase in the spinal fluid below the point of pressure, it is possible that certain degenerative diseases of the cord may produce similar changes. In the differential interpretation of these two groups of cases presenting similar path-

Fig. 5.—Method of combined lumbar and cisterna puncture, with manometers for measuring pressure. Ten c.c. of fluid has been released from the cisterna with equal drop in pressure in both manometers. Normal. The oscillatory movements, with pulse and respiration, and gross changes of pressure on coughing and on compression of the jugular veins are normally equal in the two manometers.

ologic fluids it is hoped that the comparison of two fluids will be of greater value than the examination of the lumbar fluid alone.

Nine cases, suspected of spinal block other than postmeningitic, have been thus examined. In three, there was no evidence of block, as indicated by mechanical continuity of the subarachnoid space and similar chemical findings in the two fluids. A third gave very slight difference in the fluids and judgment is suspended in interpreting its significance. Five cases showed unmistakable difference in the fluid findings, and three of these have thus far come to operation and the cause of obstruction has been found.

Two examples, showing different degrees of subarachnoid block, are given.

CASE 3.—Mr. J. G., aged 24 years, was admitted to Massachusetts General Hospital, April 7, 1920, with a history of illness, beginning with pain in the chest five months before. A few weeks later he noticed increasing weakness of his right leg and numbness in both legs. The numbness and weakness had progressed to such an extent that walking had become greatly affected. There was also difficulty in starting urine. Examination showed partial Brown-Séquard paralysis with an indefinite zone of hyperesthesia at the level of the tenth thoracic segment.

Comparative cisterna and lumbar punctures, April 9, yielded findings summarized in Table 1.

TABLE 1.—COMPARISON OF FINDINGS IN CEREBROSPINAL FLUID FROM CISTERNA AND LUMBAR PUNCTURES

	Cisterna	Lumbar
Pressure, in mm., initial *	150	170
After withdrawal of 5 c.c. from cistern **	130	165
After withdrawal of 5 c.c. from lumbar	135	85
After withdrawal of 10 c.c. from lumbar	135	30
After waiting five minutes	170	30
Character	Clear, Colorless, No Clot	Clear, Colorless, No Clot
Protein (alcohol precipitation)	Slightly +	++++
Total mg. per 100 c.c. (sulphosalicylic precipitation †)	83	1112
Globulin (ammonium sulphate precipitation)	0	++
Colloidal gold test	±±±0000000	1223332000
Erythrocytes and leukocytes	0	0
Wassermann reaction		—

* Oscillations of fluid with pulse, respiration and on coughing normal and equal.
** Oscillations remain normal and equal in both manometers.
† Unpublished method.

By this examination it is evident that there is obstruction to the free passage of fluid in the spinal subarachnoid space, as shown by manometer readings after withdrawal of fluid (Fig. 6). The examination of the fluids likewise shows a marked chemical difference, the cistern fluid appearing almost normal, the lumbar fluid presenting the "Nonne syndrome" (Figure 7).

Laminectomy was performed by Dr. W. J. Mixter and a cholesteatomatous cyst of the pia was evacuated. Subsequently the patient improved, and, May 12, combined punctures were repeated. The findings are summarized in Table 2.

TABLE 2.—COMPARISON OF FINDINGS IN CEREBROSPINAL FLUID FROM CISTERNA AND LUMBAR PUNCTURES

	Cisterna	Lumbar
Pressure, in mm., initial *	210	180
After withdrawal of 10 c.c. from cistern	160	130
After withdrawal of 10 c.c. from lumbar	100	70
Character	Clear, Colorless, No Clot	Clear, Colorless, No Clot
Protein (alcohol precipitation)	Slightly +	+
Total mg. per 100 c.c. (sulphosalicylic acid precipitation)	166	192
Globulin (ammonium sulphate precipitation)	0	0
Colloidal gold test	±±±0000000	+++++++0000
Leukocytes	2	0

* The fluid levels were the same. The head was 3 cm. lower than the lumbar spine.

The second examination showed a free subarachnoid space (Fig. 8) and the two fluids were almost normal. In this patient with a known

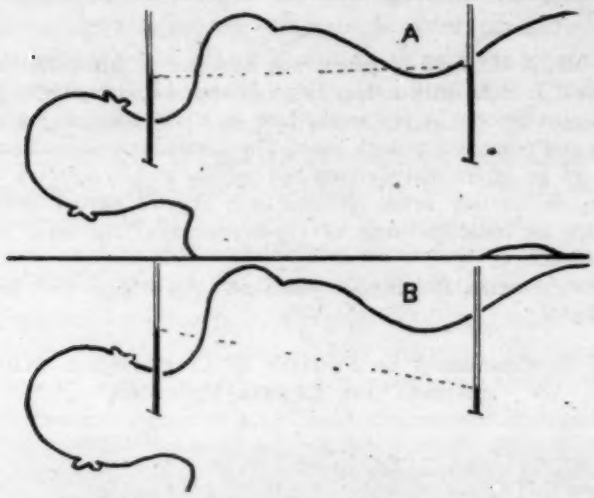

Fig. 6.—(Case 3).—Before operation. Compression of spinal cord by cholesteatomatous cyst. *A*, initial pressure in cistern and lumbar sac nearly equal. *B*, after withdrawal of fluid from the latter, the pressure below the point of compression falls, and above this point it remains elevated.

Fig. 7.—Comparative fluids from cistern, *C*, and lumbar puncture, *L*, from three cases of known compression of the spinal cord. In each case protein has been precipitated by alcohol from equal amounts of spinal fluid, the lumbar fluid in each showing the greater amount. Mr. S., tuberculosis of upper thoracic spine. Mr. G. (Case 3), cholesteatomatous cyst of pia, lower thoracic region. Mr. P. (Case 4), vertebral degenerated myeloma, lower thoracic region.

pathologic block of the spinal subarachnoid space, we were able before operation to demonstrate not only a chemical difference in the two fluids, but also mechanical obstruction to the flow of the spinal fluid. One month after surgical relief and coincident with clinical improvement, the two fluids appeared almost similar, and conclusive evidence was obtained that reestablishment of the spinal subarachnoid space had been brought about.

Case 4.—Mr. P. T. P., 33 years of age, in December, 1919, complained of abdominal pain, which was referred to the spine and shoulders, and subsequently localized in the abdomen, which became greatly distended. December 26, while he was lying down, both feet became numb, the numbness ascending within a few hours to the hips, accompanied by complete bilateral paralysis of the lower extremities, retention of urine and incontinence of feces. Examination in March showed complete paraplegia and anesthesia up to the eleventh thoracic vertebra on the left side and the ninth thoracic vertebra on the right. While no voluntary motion was possible, reflexes of defense were conspicuous. A roentgenogram of the thoracic spine was negative.

March 17, combined cisterna and lumbar punctures gave results which are summarized in Table 3.

TABLE 3.—Comparison of Findings in Cerebrospinal Fluid from Cisterna and Lumbar Punctures

	Cisterna	Lumbar
Pressure, in mm., initial *	120	120
After withdrawal of 5 c.c. from cistern	90	90
After withdrawal of 5 c.c. from lumbar	80	80
After withdrawal of 3 c.c. more from cistern	60	60
Character	Clear, Colorless, No Clot	Clear, Colorless, No Clot
Protein (alcohol precipitation)	Slightly +	Greatly +
Total mg. per 100 c.c. (sulphosalicylic acid precipitation)	100	250
Globulin	0	+
Colloidal gold test	1111000000	1543222100
Erythrocytes and leukocytes	0	0
Sugar	+	+
Wassermann reaction		—

* Oscillations with pulse, respiration and cough normal and equal in both fluids.

These findings show no mechanical obstruction to the downward passage of the spinal fluid, but marked discrepancy is seen in the protein content in the two fluids indicative of increased transudation into the fluid from a source between the two needles.

On account of the rapid onset of the symptoms of transverse myelitis the patient was sent home with a diagnosis of myelitis, probably degenerative. The next month he returned, laminectomy was performed, and an infected vertebral myeloma, pressing on the dura, was found.

While we must admit the coincidence of both compression and a toxic agent in the causation of the symptoms in this case, it is the opinion of the author that the spinal fluid changes are principally the result of the compression.

The third case in which the diagnosis of cord compression was demonstrated at operation presented both mechanical and chemical changes in the fluids even more striking than in Case 3. The pathologic lesion in this case was tuberculosis of the upper thoracic spine.

On the basis of the clinical examination in these three cases the neurologist might say that the diagnosis of cord compression was already sufficient without any help from spinal fluid findings. This was certainly true of the man with Pott's disease; the diagnosis was almost assured in Case 3, but not at all certain in Case 4. In fact, this last patient was sent home after two weeks' study in the hospital with a tentative diagnosis of degenerative myelitis. Every diagnostician will admit of finding cord degeneration at operation when tumor has been expected, and, vice versa, a tumor or cyst or other cause of compression is not infrequently present when least expected. Confirmatory

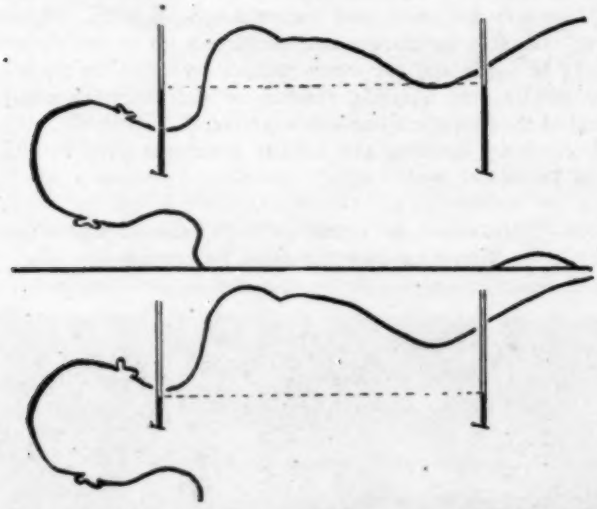

Fig. 8. (Case 3).—After operation. Pressure in cistern and in lumbar sac falls promptly and equally whether fluid is withdrawn from one or the other needle. The continuity of the subarachnoid space has been reestablished by operation.

evidence from spinal fluid examination should therefore be most welcome in all such cases. That negative findings are proof against the presence of cord compression is not maintained, for twice I have obtained normal fluids from below tumors (lumbar puncture alone); that positive spinal fluid findings are usually found below the level of cord compression has been my experience and that of many writers. It is to be hoped that a comparison between the fluid findings above and below a compressed area of the spinal cord, made possible by the method here described, will give information of greater significance and reliability than is to be obtained from examination of the lumbar fluid alone, and thus the procedure will aid in earlier diagnosis of spinal cord compression.

CONCLUSIONS

Puncture of the cisterna magna should be employed when it is desirable to reach the upper reservoirs of the cerebrospinal fluid system. It may be employed alone but is frequently used to greater advantage in connection with lumbar puncture, and occasionally with ventricular puncture.

The technic has been found to be easy to acquire, and should prove safe in the hands of a careful operator. Preliminary experience on the cadaver should, however, be insisted on before its application.

This procedure, as carried out forty-three times in twenty patients, has proved of value either for diagnostic or therapeutic purposes. It has been used to advantage in the diagnosis and treatment of cases of postmeningitic subarachnoid block. It has been employed in the treatment of a selected group of cases of cerebral syphilis and in one case of epidemic meningitis. In connection with lumbar puncture it has proved of value in the diagnosis of cord compression from causes other than meningitis.

THE COINCIDENCE OF CERVICAL RIBS AND SYRINGOMYELIA *

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The Berlin surgeon Borchardt [1] appears first to have observed the coexistence of cervical ribs and syringomyelia, in a woman 35 years old, who also was examined by Oppenheim. The latter [2] in his textbook comments on this case and points out that cervical ribs belong to the so-called stigmas of degeneration and may be combined with other disorders which are not caused by the ribs but, like them, are features of an underlying neuropathic diathesis. He specifically mentions hysteria, hypochondriasis and spinal gliosis. In connection with the latter he refers to the case mentioned above and to one reported by Marburg.[3] This case, which occurred in a woman 19 years old, was complicated by scoliosis which caused the cervical ribs to be prominent and to be mistaken for a bony tumor until operative removal was attempted. Later the appearance of sensory dissociation, painless burns, muscular atrophy and lagophthalmos led to a positive diagnosis of syringomyelia. I have found no other cases in a rather hasty search of the literature, but the combination has been the subject of comment. Thus, Haenel [4] warns that the onset of brachial pains, atrophies and cervical scoliosis or kyphosis in a young person with cervical ribs should lead one to suspect syringomyelia. Jelliffe and White [5] state: "Several cases have been observed in which a cervical rib was removed from a patient suffering from syringomyelia to which the symptoms were due."

In Streissler's [6] comprehensive review of the subject of cervical ribs, Oppenheim's idea of their being degenerative stigmas is looked on with favor. He mentions scoliosis in the cervical and upper thoracic region as a frequent association and does not consider it secondary to the rib, also spina bifida and other malformations, such as harelip,

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* Read at the Forty-Sixth Annual Meeting of the American Neurological Association, New York, June, 1920.

1. Borchardt, M.: Symptomatologie und Therapie der Halsrippen, Berl. klin. Wchnschr. **38**:1265, 1901.
2. Oppenheim, H.: Lehrbuch der Nervenkrankheiten, Ed. 5, pp. 498 and 440.
3. Marburg, O.: Syringomyelie und Halsrippe, Wien. klin. Rundschau **20**: 241, 1906.
4. Haenel, H.: Handbuch der Neurologie **2**: 609.
5. Jelliffe and White: Diseases of the Nervous System, Ed. 1, p. 301.
6. Streissler, E.: Die Halsrippen, Ergebn. d. Chir. u. Orthop. **5**:280, 1913.

cryptorchidism, dislocated lenses, clubfoot, congenital lipoma; finally, combination with psychoneuroses, syringomyelia, multiple sclerosis (Levi),[7] muscular atrophy (Spiller and Gittings).[8]

REPORT OF CASES

CASE 1.—*History.*—The early history of this case is related by the late Dr. John B. Murphy.[9] A man, 34 years of age, was admitted to Mercy Hospital, Nov. 2, 1915. Nine months before, on Feb. 13, 1915, he slipped on the ice and fell. Two days later he had fever (100 F.), pain in the cervical region of his spine, and universal muscular tenderness, and took to bed for two days under the impression that he had grip.

Ten days after the onset of the pain in the cervical region of the spine, it radiated down the left upper extremity until it reached the fingers, where it remained. The pain was worse during the night. There was, however, no atrophy of the muscles of the hand and no alteration in the color of the skin. Pain was present in the right upper extremity.

Examination.—Palpation of the neck revealed an elongation at the tip of the transverse process of the left seventh cervical vertebra—at the site which appears to be just under the point of greatest pain irritation; the space between the process and the clavicle was diminished but not occluded. In making the comparative examination between the right and left sides it was found that on the right side the whole thumb could be inserted into the supraclavicular space, while on the left but two thirds of the digit could be inserted. There was a seventh cervical rib on the left side which put tension on the eighth cervical nerve on its way to the ulnar.

The cervical rib was plainly demonstrated by the roentgen ray.

Treatment and Course.—On Nov. 5, 1915, Dr. Murphy operated and during the operation he said: "Now you can see in the field the anterior portion of the cervical rib; instead of being a round, blunt process, it is articulated and exhibits a sharp dentate edge which nips the brachial plexus and accounts for the pain radiating down along the arm to the forearm and hand. The plexus has been displaced." After removing the rib he added: "With the rib out of the way, it is clearly to be seen where the brachial plexus was compressed by the rib. The nerve to the rhomboids was involved, showing that the fifth cervical nerve from which this branch takes origin, felt the stress of the compressing rib. The knife-blade-like edge of the cervical rib had irritated the brachial plexus until a membrane formed upon one of its constituents—the eighth cervical from which the ulnar nerve is derived."

A postscript dated Jan. 7, 1916, says: "The patient made an uneventful recovery, and at the present time the preoperative thickening which was present in the lower portion of the left side of the neck has to a great extent subsided."

This apparently happy ending was really only the introductory chapter to the story of this patient's troubles. He soon began to have severe pain in the scar and then in the whole arm as before. Examination by the writer on

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7. Levi, H.: Beitrag zur Kasuistik. der Halsrippen, Neurol. Centralbl. **23**: 988, 1904.

8. Spiller, W. G., and Gittings, J. C.: Progressive Muscular Atrophy of Cervicobulbar Type, Occurring with Cervical Rib, New York M. J. **84**:683, 1906.

9. Murphy, John B.: Cervical Rib, The Clinics of John B. Murphy **5**:227 (April) 1916.

Oct. 6, 1916, revealed analgesic areas along the outside of the left arm and forearm and absence of the wrist and elbow reflexes on the left side while these reflexes were normal on the right side.

A more detailed examination was made on March 31, 1917: There were relative analgesia and thermo-anesthesia on the left side in the distribution of all the segments from the second cervical to the third thoracic. Circumference of the arms: right, 27 cm.; left, 23.5 cm.; forearm, right, 23 cm.; left, 21.5 cm.; hand, right, 20 cm.; left, 18 cm.

A lumbar puncture was made at this time and the Wassermann, Lange, and Nonne tests were negative; the cell count was 7.

A tentative diagnosis of syringomyelia was made and the patient was given roentgen-ray treatments of the lower cervical region of the spine.

Since that time the patient has been examined every few months. Both the subjective symptoms and the findings have remained practically the same. He was recently thoroughly studied by Dr. William G. Spiller, who also made a diagnosis of syringomyelia.

Case 2.—*History.*—A woman, about 40 years old, was referred to the writer for examination by Dr. George F. Dick in October, 1916. Thirteen years previously she had first noticed atrophy in the right hand, and in the left hand during the preceding year only. There was no pain but the hands had become weak. Roentgen-ray examination had revealed distinct cervical ribs on both sides. An operation had been considered but on account of the high degree of atrophy and disability of the hands a more serious disorder was suspected.

Examination.—Examination at this time, in addition to the atrophy of the small muscles of the hands, revealed extensive analgesia and thermal anesthesia of both arms and of the chest and back on both sides down to the fourth rib. The right pupil was larger than the left and the right palpebral fissure smaller than the left, showing involvement of the cervical sympathetic. The tendon reflexes in the legs were moderately increased but there was no clonus and the plantar reflexes were normal.

The patient was examined again in April, 1920, and the picture of syringomyelia was more fully developed. The atrophy of the hands was marked. The thumbs and fingers were hyperextended at the metacarpophalangeal joints and flexed at the phalangeal joints. There was no power of abduction and adduction of the fingers or of opposition of the thumbs. Flexion at the wrists was weak; extension a little better. The other arm movements were quite strong. The loss of pain and temperature sense now involved the neck and the trunk as far down as the level of the umbilicus. Tactile sensation remained normal. The knee reflexes were increased and ankle clonus was present on both sides. The abdominal, wrist and elbow reflexes were absent, the plantar reflexes normal.

Case 3.—*History.*—For the privilege of seeing and recording this case I am indebted to Dr. Lewis J. Pollock, who already had made a diagnosis of syringomyelia. He and I had examined the first patient reported in this paper a short time before and with the coincidence of the two affections in mind Dr. Pollock had sent the patient to Dr. Hollis E. Potter for roentgenologic examination which, to the great surprise of all concerned, showed bilateral cervical ribs, much larger on the right side.

The main points in the clinical history, which did not at all suggest cervical rib were:

The patient, a business man, single, 32 years old, when examined in July, 1919, a few days after excessive sexual indulgence in 1907, noticed a sensation of warmth in the right leg. During the following month the whole right side became involved and there was a sensation of tingling. The right side became somewhat rigid. A few days after the onset a physician had discovered analgesia and thermal anesthesia of the whole right side, while tactile sense was preserved. At the time of examination the chief complaint was numbness in the right leg.

Examination.—Examination revealed loss of temperature sense in the whole right lower extremity and diminution of this sensation on the right side of the rest of the body, gradually diminishing upward; even the face was slightly involved. Sensation to pain was diminished in the right leg and slightly so in the right arm and right side of the trunk. Tactile and joint sensation were normal and vibration sense slightly diminished on the left side. All of the tendon reflexes, as well as the abdominal and cremasteric reflexes, were diminished on the right side, the ankle reflex showing the greatest degree of diminution. There was no atrophy or paralysis, and coordination was normal. The Wassermann test with blood and spinal fluid and all other spinal fluid tests were negative.

CONCLUSION

In conclusion, I wish to state that were I to be guided by my own experience, which is very limited, I would be inclined to regard all bearers of cervical ribs with extreme suspicion and to accept them as possessed of well-balanced minds and structurally normal central nervous systems only after very close scrutiny. Three patients whose local symptoms led me to advise operation, which in each case was a surgical success, were made decidedly worse, one passing through a severe postoperative psychoneurosis, the other two having now led for years miserable lives as profound hypochondriacs with persistence of the local symptoms in spite of repeated subsequent exposures of the brachial plexus and injections of procain and dilute alcohol.

Fortunately, this gloomy picture is incorrect when a broad view of the situation is taken. Good results from operation in a large series of cases are reported by so many reliable observers that even repeated ill luck in one person's experience should not shake our optimism.

30 North Michigan Boulevard.

THE FREQUENCY OF ALBUMINURIA WITH CASTS IN EPILEPTICS FOLLOWING CONVULSIVE SEIZURES.

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It has frequently been stated that in epileptic individuals, albumin with casts is at times found in the urine voided immediately after attacks. Its presence is accounted for by several observers as probably due to admixture of semen liberated into the urine by pressure on the seminal vesicles during the convulsive movements. By others it is attributed to muscular contractions. In the first instance the condition would fall in the class of accidental albuminuria, in the second it might come under the heading of physiologic albuminuria. Textbooks on clinical pathology and diagnosis discuss the condition under neurotic albuminuria.

As to the frequency of abnormalities in postseizure urine in epileptics, Simon [1] states: "in a number of cases in which I had occasion to examine urine voided after an attack (epileptic), albumin was usually absent." In another place the same author states that the cases referred to were those exhibiting the petit mal attacks, and that one case which had been in the epileptic state for forty-eight hours showed albumin, semen being absent. Nothnagel [2] could not demonstrate any regularity in the occurrence of albuminuria in a number of cases of epilepsy under his observation, neither was he able to correlate the positive findings in some cases with the nature of the attack—grand mal or petit mal. Munson,[3] in speaking about the general treatment of epilepsies, mentions that about 20 per cent. of his cases showed the presence of albumin and casts following attack.

It is worth while to review here the physiologic conception as to how albuminous substances find their way into the urine in disease and in health so that we may be able to justify some conclusions drawn from the study in this paper. Sir William Osler [4] states substantially that under normal conditions of kidney function the glomerular epi-

1. Simon, C. E.: A Manual of Clinical Diagnosis, Ed. 9, Philadelphia, Lea & Febiger, 1918, p. 383.

2. Nothnagel, cited by Simon, Footnote 1.

3. Munson, J. F., in White, W. A., and Jelliffe, S. E.: Modern Treatment of Nervous and Mental Diseases 2:266, 1913.

4. Osler, William: Principles and Practice of Medicine, Ed. 8, New York, D. Appleton & Co., 1914, p. 684.

thelial cells allow the passage of only water and salt from the circulating blood, and will not permit albuminous substances to filter through. Injury to these cells by disease results in free passage of albumin and other protein substances. According to all observers, in physiologic albuminuria, the epithelium is not impaired permanently and the occurrence of albuminous matter in the urine is, therefore, attributed to muscular contraction as, for instance, in the course of violent exercise during athletic engagements or possibly during convulsive attacks in certain diseases. Whether it be called physiologic, or as recent writers tend to call it, constitutional albuminuria, all agree that such a condition is probably outside the pathologic domain. Should the albuminuria following convulsive seizures in epilepsy be considered as physiologic?

This paper presents a study of a number of epileptics in our hospital where tests were made under favorable conditions. The study makes no claim to anything new but attempts to clear up a point of disagreement in that direction.

By request of the laboratory a specimen of urine was received from every case of epilepsy, following as soon as the patient regained consciousness after an attack. The specimens were examined as soon as practicable after reaching the laboratory. The presence of albumin was determined by the heat and acetic acid test and the microscopic work was done with a centrifugalized portion, using the flat mirror of the microscope. It was sought to determine the following points:

1. The general frequency of albumin with casts and other microscopic findings in the number of cases under observation. As already intimated, the frequency of positive urinary postseizure findings has been underestimated by some workers, and Simon concludes that albuminuria following seizures in epilepsy is the exception rather than the rule.

2. The length of time subsequent to an epileptic convulsive seizure that albuminuria with casts can be demonstrated. Does only the first urine after an attack contain albumin, or does the albuminuria persist for a longer period? Stated differently, does the period of unconsciousness hold any relation to the urinary findings?

3. The relation of accidental albuminuria, as evidenced by the presence of semen, to albuminuria due to the convulsive seizures per se. As noted above, semen as a contaminating agent in the causation of albuminuria following convulsive attacks of epileptics has probably been given undeserved prominence as an accidental agent. While it is true that in the presence of semen the albuminuria is quantitatively increased, the presence of albumin in the absence of semen is comparatively greater. From the number of examinations recorded in

Table 1, the author is inclined to believe that seminal fluid, as an albuminurious factor in epilepsy following seizures, plays a rôle of no great significance. The following statement by such a reputable observer as Simon is of particular interest in this connection, as it conveys the impression that semen is the only agent causing albuminuria in postepileptic seizures. "The seizures in those cases were comparatively slight and unfortunately an examination for semen was not made in those urines in which traces of albumin were demonstrated." Admitting that there may be present a small quantity of semen in the urine of every epileptic individual subsequent to seizures, we cannot always attribute the albuminuria to this cause, as the quantity of urine voided will readily change the albuminuria index: the greater the quantity of urine, the amount of semen remaining constant, the less the chances for demonstrating the albuminuria with our present qualitative methods. Furthermore, the presence of granular casts along with albuminuria is prima facie evidence that it is not of accidental origin through admixture of semen.

4. The possibility of differentiating true epileptic seizures from hysteria or epileptiform convulsions. Simple and unadorned as such a laboratory procedure might prove to be in such diseases as epilepsy and hysteria requiring psychologic study, this point was nevertheless kept in mind as the examination of the material proceeded.

From Table 1 it will be seen that two cases (P. B. and D. M.), whose urine was examined ten and nine times, respectively, corresponding to the same number of attacks, have shown no albumin and no casts to any degree; they were diagnosed clinically as hysteria. This number of cases is entirely too small for differential diagnostic study. Observation of a large number of cases over a long period would seem essential. Perhaps, taking the view of the general frequency of albuminuria in the number of cases studied as physiologic and apparently due to muscular contraction effected during the seizures, we may probably account for the absence of urinary findings in the hysteria cases, as the hysteric individual often does not present the typical convulsion of the genuine epileptic; the hysteric frequently simulates the epileptic in his seizure manifestations, especially when brought to live in contact with the epileptic. There would, moreover, seem to be no physiologic cause for albuminuria in hysteria as the hysteric is perhaps physically not concerned in his apparently epileptiform spells. This consideration would suggest an affirmative answer to the question brought forth in this paper as to whether the albuminuria with casts in postepileptic seizures is physiologic. The subject of physiologic albuminuria in general would thus find a supporting point. The summarized table also shows that forty cases, or 66 per cent., have shown albumin with casts after every attack; 193 specimens were examined

TABLE 1.—SHOWING THE FREQUENCY OF ATTACKS, DURATION AND NUMBER OF SEIZURES AND URINARY FINDINGS

Case	Average Time After Seizures, Hours	Approximate Duration of Seizures, Minutes	Number of Seizures During Six Months' Residence			Albumin	Casts	No. Times Examined	No. Times Negative	Semen
			Diurnal	Nocturnal	Total					
E. Z.	9	10	1	7	8	+	+	5	2	—
J. E.	3½	10	10	7	17	+	+	3	0	—
S. G.*	12-15	15	7	10	17	+	+	4	0	—
V. McC.	11-19	15	5	3	8	+	+	3	1	—
F. J.	21	15	1	3	4	+	+	1	0	+
W. S.	12	120	3	—	3	—	—	1	1	—
W. R.	2-6	15	37	26	63	+	+	7	0	+
J. D.	11	15	2	1	3	+	+	1	0	—
E. W.	18	10	1	4	5	+	+	2	1	—
F. S.	10-18	10	3	2	5	+	+	2	1	—
J. O'R.	6-7	5	6	15	21	+	+	6	0	—
E. O'C.	15	5	1	0	1	+	+	1	0	+
R. W.	9	10	1	1	2	+	+	2	0	—
R. B.	9	15	2	3	5	+	—	2	0	—
A. P.	10	10	4	2	6	+	+	1	0	—
C. H.	5-12	10	1	7	8	+	+	3	0	—
L. A.	6	10	5	3	8	+	+	3	0	—
G. W.	9-12	50	8	7	15	+	+	4	0	—
E. C.	8	15	26	14	40	+	—	3	0	—
C. L.	4-9	15	5	4	9	+	+	3	0	—
D. S.	6	10	2	4	6	+	—	2	0	+
J. L.	8	15	1	2	3	—	—	1	1	—
F. F.	11	15	1	4	5	+	+	2	0	—
A. M.	8	2	49	21	70	+	—	2	0	—
J. S.	12	120	21	9	30	+	+	1	0	—
F. J.	12	7	0	1	1	+	+	1	0	—
R. W.	?	20	0	6	6	+	+	1	0	—
H. G.	13	15	0	2	2	+	+	1	0	—
H. B.	14	30	4	4	8	—	+	1	0	—
B. D.	?	60	17	17	34	+	+	2	0	—
W. L.	1-10	15	29	5	34	+	+	10	0	—
J. R.	3-9	10	1	4	5	+	+	4	0	+
C. D.	9	20	1	3	4	+	+	1	0	+
J. B.	9-10	20	15	39	54	+	+	3	0	+
B. H.	9	20	3	0	3	—	—	3	3	—
O. B.	6	15	13	4	17	—	+	2	1	—
D. P.	21-24	15	4	1	5	—	—	2	2	—
W. E.	4-24	10	18	8	26	+	+	4	2	—
P. W.	4-15	15	17	11	28	+	+	6	2	—
A. C.	15	15	11	15	26	+	+	3	1	—
E. W.	7	10	1	3	4	+	+	2	0	—
J. P.	6-9	15	1	7	8	+	+	3	1	—
H. C.	6-12	15	5	10	15	+	+	4	1	—
C. W.*	8-9	10	15	30	45	++	++	10	0	—
L. S.	3-9	10	2	8	10	++	++	5	1	—
E. M.	3-6	15	3	25	28	++	+	6	0	—
G. L.	4	10	4	4	8	+	+	2	0	—
T. E.	4-9	15	1	11	12	++	+	6	0	—
D. M.	12-18	8	9	15	24	—	—	9	9	—
W. T.	4-6	15	7	25	32	++	+	8	0	+
W. C.	9	10	17	13	30	+	+	1	0	—
J. F.	6-13	20	25	6	31	+	—	2	1	+
W. B.	5	20	1	4	5	+	+	2	0	+
E. J.	12-16	10	15	9	24	+	+	3	2	—
W. H.	10-12	12	2	61	63	+	+	9	0	+
R. H.	8-15	15	8	10	18	+	+	7	5	—
L. A.	12	10	55	5	60	+	+	6	0	—
D. A.	22	10	7	—	7	+	+	—	0	—
M. W.	14	3	1	1	2	+	+	1	0	—
H. H.	3-10	15	1	3	4	+	+	3	0	—
S. P.	3-5	10	1	2	3	+	+	3	0	+
P. B.	6-9	5	14	31	45	—	—	10	10	—

* Positive Wassermann reaction. + = Beyond a trace. ++ = Appreciable trace.

with an average of 3.1 per patient. In thirteen cases the urine was positive after some attacks and negative after others in the same individual. While the regularly positive cases include several whose urine was examined after one or two attacks and perhaps would have become irregular as far as the urinary findings are concerned, it is believed that the irregular cases would have been considerably reduced if in many instances the first urine voided after an attack had reached the laboratory. A patient who is seized in the early evening hours is likely to have voided once before the next morning's specimen is taken. Frequent changes in attendant personnel on the wards would tend toward the same error. I have not been able to find any relation between frequency of seizures and regularity of positive findings in the urine subsequent to the seizures. Table 2 shows nine cases whose frequency of attacks during a period of six months' residence in the hospital ranged numerically from 21 to 70. At no time after seizures was the urine free from albumin and casts. Several of these cases have tended to persist in showing abnormal urine for from twenty-four to forty-eight hours subsequent to the attack. It seems reasonable to assume that very frequent seizures would tend to produce an unfavorable renal condition. This fact was emphasized by Munson when speaking of specific therapy for those giving indications for treatment.

TABLE 2.—Selected Cases from Table 1. Frequency of Seizures During Six Months in Hospital, and Urinary Findings

Case	Number of Attacks	Number Urine Positive	Number Urine Negative	Persistence of Urinary Abnormalities. Hours
F. J.	1	1	0	Negative
J. O'R.	21	6	0	Negative
E. M.	28	6	0	24
W. T.	32	8	0	24
W. L.	34	10	0	24
C. W.	45	10	0	48
J. B.	54	3	0	24
W. H.	63	9	0	48
W. R.	63	7	0	24

TABLE 3.—Summary of Table 1

Total Number Cases	No. Cases Regularly Positive	No. Cases Regularly Negative	Number Irregular Cases	Total No. Specimens Examined	Average per Patient	No. Cases Semen Present
60	40 (66%)	4 (6.6%)	13 (21.6%)	198	3.1	12 (22.6%)

A glance at Table 3 will also show that the incidence of semen with albuminuria as a probable factor of contamination was found to be 22.6 per cent. in a series of sixty cases. While these cases have shown

a slight increase in the quantity of albumin over those whose urine did not contain that element, casts were simultaneously demonstrated. Other quite constant findings were those of amorphous urates and phosphates. Since the material was examined during the winter months, these findings would be of no significance. I have not been able to demonstrate glycosuria in a number of the specimens obtained after attacks, though some workers have reported sugar to be present in the urine in epileptics following seizures.

CONCLUSIONS

1. In a series of sixty cases of epilepsy, two-thirds, or 66 per cent., have shown albuminuria with granular casts after every seizure. Two cases of this series who were diagnosed clinically as hysteria, gave no evidence of either albumin or casts in the urine after repeated examinations following epileptiform seizures.

2. Albuminuria with casts persist for from twenty-four to forty-eight hours subsequent to attacks in some genuine epileptics.

3. The frequency of seizures, while apparently holding no relation to positive urinary findings, tends in general toward regularity of urinary abnormalities after attacks.

4. The duration of seizures seems to bear no relation to subsequent albuminuria.

5. Seminal fluid as a contaminating factor giving rise to albuminuria after epileptic seizures does not play a very great rôle.

6. An investigation into the frequency of nephritis in epilepsy is suggested.

My thanks are due to Mrs. Mary E. Aucoin, chief nurse of the hospital, for her cooperation and kind assistance.

CORRECTION

In the article by Dr. Charles Frazier, which appeared in the August issue of the ARCHIVES OF NEUROLOGY AND PSYCHIATRY, the tracts in the illustration of the cord, on page 139, were incorrectly outlined. This illustration was inadvertently sent with the manuscript. The correct illustration appears in the reprint, a copy of which may be secured by sending a stamped, addressed envelope to the author.

The author also calls attention to an error in his manuscript: "latterly I have chosen the sixth cervical segment." This appears in the nineteenth line from the top of page 140. It should read: "latterly I have chosen the sixth thoracic segment."

Editorial

COMPENSATION AND "CONDUCT DISORDERS"

Among the many excellent points brought out in Dr. Dana's article on "Wounds of the Head and Compensation Laws," the one that refers to final compensation seems to be of especial importance. There should be no objection to final compensation by the state for such injuries as can be definitely measured or determined; for the loss of an eye or a limb, a prompt final settlement seems to be the most suitable compensation.

It is not of these cases, however, that Dr. Dana writes. On the contrary, the symptoms complained of by the majority of the survivors of head injuries are rarely of a character to be evaluated accurately by the physician, except in so far as he believes the statements of the patient or of his witnesses. They belong to the order called functional, or to "conduct disorders" as Dana prefers to call them, and, after a reasonable time for rest has elapsed, the sovereign remedy for them is *morale*. A neurotic conduct disorder is maintained with the idea, conscious or subconscious, that some benefit will be derived from it. When that idea is removed, the neurotic patient makes a much better adjustment. For the good of the patient and the benefit of the commonwealth, in appropriate cases, it is the duty of the state, when compensation is sought, to combat that idea from the outset. The state would do so if competent neurologists were its advisors; but they rarely are. Neurologists must take a more active interest in legislative affairs before legislators will be willing to allow them to decide that certain fairly definite symptom groups are exceptions to the general rule, and that the patients are injured by compensation. The legislators might be convinced individually, but it is more difficult to convince them as a group. And yet what inestimable benefit France did itself and its soldiers by deciding that purely functional cases were not eligible for pension!

P. B.

News and Comment

FIRST ANNUAL MEETING OF THE ASSOCIATION FOR RESEARCH IN NERVOUS AND MENTAL DISEASES

The first annual meeting of the Association for Research in Nervous and Mental Diseases will be held during the Christmas week of 1920 in New York City. The subject for discussion will be "The Acute Nonsuppurative Infections of the Nervous System." The exact date and place of the meeting will be announced in the December number of the ARCHIVES and full particulars, including the program, will be published in that issue.

The secretaries of all interested neurologic or psychiatric societies may obtain the necessary blank forms for membership application from the secretary-treasurer, Dr. Foster Kennedy, 20 West Fiftieth Street, New York City. All members in good standing in any neurologic or psychiatric society are eligible to membership on payment of the annual dues of $5. This fee entitles the member to a copy of the transactions, which will be published by the Commission of the Association after the meeting.

HARVARD PROFESSORSHIP IN PSYCHIATRY

Dr. Charles MacFie Campbell, assistant director of the Henry Phipps Psychiatric Clinic, Johns Hopkins Hospital, has severed his connection with the clinic in order to become professor of psychiatry at Harvard Medical School and director of the Boston Psychopathic Hospital. Dr. Campbell will assume his new duties, October 1.

Abstracts from Current Literature

STUDIES ON ARTHRITIS IN THE ARMY BASED ON FOUR HUNDRED CASES. I. PREAMBLE AND STATISTICAL ANALYSIS. RALPH PEMBERTON, with the assistance of JOHN W. ROBERTSON, Arch. Int. Med. **25**:231 (March) 1920.

A decision of the surgeon-general permitted a study of chronic arthritis on a scale larger than has been possible in this country since the Civil War.

Statistical Analysis of Four Hundred Cases of Arthritis Admitted to the U. S. Army General Hospital No. 9, Lakewood, N. J.—It was found that 64 per cent. of the patients had arthritis only; 28 per cent. had a combination of arthritis and myositis; 5.5 per cent had myositis only; 1.75 per cent. had nerve involvement (neuritis) only, and 0.75 per cent. were listed as doubtful. The average age was 28.26 years, while that of the worst cases showing the least improvement was 29.38 years.

TABLE 1.—PRECIPITATING FACTORS IN ORDER OF FREQUENCY

	No. Cases	Percentage
Exposure	232	58.0
Dysentery	33	8.25
Injury	30	7.5
"Flu"	28	7.0
"Gas"	23	5.75
Drilling and hiking	15	3.75
Tonsillitis	13	3.25
Pneumonia	6	1.5
Neisserian infection	4	1.0

One hundred and forty-three patients (33.75 per cent.) had had attacks of "rheumatism" prior to army service. Only eight of 113 nonarthritis patients on the surgical and orthopedic wards, questioned at random, had had such attacks.

TABLE 2.—DISTRIBUTION OF INVOLVEMENT

	Percentage
Knee	62.0
Ankle	35.25
Hip	33.73
Shoulder	31.75
Legs (muscle)	22.25
Hand	14.50
Spine	13.50
Foot	12.0
Wrist	11.75
Elbow	9.75
Back (muscle)	8.25
Arm	7.50
Thigh	7.0
Ileosacral joint	4.0
Heel	1.75
Sciatic nerve	1.0
Jaw	0.75
Lumbosacral joint	0.50
Facial nerve	0.25

It was noted that 57 per cent. showed a combination of two or more of the above distributions.

Relative to Surgical Foci.—One hundred and seven persons (26.75 per cent.) were taken sick in the apparent absence of demonstrable surgical foci; 73.25 per cent. showed demonstrable surgical foci. Of the latter number, 71 per cent. showed foci in the tonsils and 45.73 per cent. of those showing a demonstrable surgical focus were positive for a dental focus. Seventeen per cent. of those showing a focus were positive for a genito-urinary focus. Of the 293 persons showing a focus in any of the above three distributions, 26.62 per cent. showed a combination of both dental and tonsillar foci, and 13 per cent. some combination of foci other than dental and tonsillar.

TABLE 3.—REGARDING PROGRESS

Percentage	Remarks
23.0	Recovered in the apparent absence of a demonstrable focus
46.0	Recovered in the presence of a demonstrable focus
8.50	Recovered after the removal of foci
7.75	Improved after the removal of foci
7.0	Unimproved after the removal of foci
77.75	Recovered "by whatever means"
18.50	Improved "by whatever means"
4.0	Unimproved "by whatever means"

It seems to be quite clear that after making all allowances for error, exposure to cold and wet is a factor of major importance in producing rheumatoid and arthritic disabilities among soldiers in service under present conditions of warfare. After considering all factors, it would seem that mechanical agencies, such as trauma in marching, played a rôle not conspicuously greater than they do in civil life.

The fact that 184 patients (46 per cent.) recovered in the presence of demonstrable foci appears somewhat at variance with the relation focal infections are known frequently to bear to the disease but should not be interpreted as justifying neglect of this established rôle. It is probable that a distinct contrast to the conditions influencing chronic arthritis in civil life is here evidenced, and that the age of the subjects and the recuperative powers of youth must be given large significance. It seems safe to conclude that genito-urinary infections played a small rôle in the causation of chronic arthritis in the army.

II. OBSERVATIONS ON THE BASAL METABOLISM. RALPH PEMBERTON and EDNA H. TOMPKINS, Arch. Int. Med. **25**:241 (March) 1920.

Some evidence has indicated that a variety of agents supposed to hasten body metabolism, such as thyroid extract, radium and the roentgen ray, may exercise definitely beneficial effects on chronic arthritis and that certain patients do much better on a lowered food intake, particularly of carbohydrate. These and other considerations have suggested that there might be in chronic arthritis a lowering or retardation of body metabolism which would express itself in summation figures. The basal metabolism was, therefore, studied in a series of twenty-nine cases. Of these, 80 per cent. showed a metabolism within normal limits; in 20 per cent. it was slightly below normal.

III. STUDIES ON THE NITROGEN, UREA, CARBON DIOXID COMBINING POWER, CALCIUM, TOTAL FAT AND CHOLESTEROL OF THE FASTING BLOOD, RENAL FUNCTION, BLOOD SUGAR AND SUGAR TOLERANCE. RALPH PEMBERTON and GOODWIN L. FOSTER, Arch. Int. Med. **25**:243 (March) 1920.

Nitrogen and Urea of the Blood.—In previous communications evidence was advanced to show that there is no disturbance of the fasting level of the blood urea or nonprotein nitrogen in cases of chronic arthritis. Determinations of blood nitrogen and urea, conducted on seventeen patients of this series, show that all cases, including those of the most severe type, fall well within normal limits. These conclusions were confirmed by Lieut. Thomas E. Buckman on forty other patients.

Carbon Dioxid Combining Power of the Blood.—Studies were conducted on seventeen cases in respect to the carbon dioxid combining power of the blood as an index of acidosis. In every case the figures fell well within normal limits, the lowest being 53 and the highest 67.

The Calcium of the Circulating Blood.—In view of the known absorption and deposition of lime salts in chronic arthritis affecting osseous tissues, observations were made on the calcium in the fasting blood in various types. Ten cases were studied, and the results were with surprising uniformity within normal limits. The cases studied were mostly of great severity, although three patients of the series represented milder types.

The Total Fat and Cholesterol of the Fasting Blood.—Of late a considerable field of investigation has been opened up in connection with the blood fats and chlosterol and their relation to metabolism, more particularly since the introduction of Bloor's simpler analytic methods. Data in a variety of pathologic conditions tend to place certain phases of the metabolism of fat on a basis analogous to that obtaining with the nitrogen and urea of the blood. Studies were, therefore, conducted on the total fats and cholesterol of the fasting blood, using the method of Bloor. Determinations were made on fourteen subjects, but gave results which fall within the rather wide range attributed to normal values. All degrees of severity of the disease were represented.

The Renal Function.—Until the rôle played by focal infections was appreciated, it was the custom, and still is in many quarters, to attach chief importance in the therapesis of arthritis to stimulation of eliminative functions, particularly those of the skin. While such measures are useful, they rarely remove the cause of the disease, and the results attributed to them are sometimes referable to other incidental or intended factors.

Of the several tests of kidney function, the method depending on the test meal of Hedinger and Schlayer, modified by Mosenthal, probably gives the earliest indications of diminished kidney efficiency. It has not been applied hitherto to the study of arthritis in a large way. This test depends on the eliminative response of the kidney to approximately constant amounts of water, salt and nitrogen ingested in a generous mixed dietary of about 2,100 calories. We, therefore, adopted this test as a further means of studying the renal function in a considerable series of arthritics and normal persons.

The results of this test indicate that individual cases of arthritis occasionally show low outputs of water for the twenty-four hour period, and sometimes retention of salt and nitrogen. The mean water output of twenty-nine arthritic patients shows a normal total volume of 1,200 c.c.; the mean salt output an approximately normal amount of 11.36 gm., and the mean nitrogen output an

approximately normal amount of 11.1 gm. The rather wide range allowed to normality makes it difficult to attach importance to small departures from it. Comparison of these figures with those from normal persons shows on the part of the arthritic patients a mean water output about the same as that of normal persons, a mean nitrogen output slightly smaller, and a rather lower mean salt output.

Observations were also conducted on phenolsulphonephthalein elimination. The results were all normal. Hanzlik, in studying the salicylates, has found phenolsulphonephthalein values ranging from 55 to 75 per cent., and has concluded that renal functional efficiency is quite as good in the rheumatic as in the normal individual.

The Blood Sugar.—It has been shown by one of us that in a considerable percentage of cases of chronic arthritis there is a definite relation between the intake of food and the incidence or perpetuation of symptoms of the disease. This relation is best illustrated by the fact that in appropriate cases the institution of a reduced diet may be followed by marked benefit. Of the three foodstuffs, the evidence at hand indicated that carbohydrate is most concerned in this connection. It became pertinent, therefore, to determine whether there is difficulty in the metabolism of carbohydrate, and to this end studies were carried out in sixty cases of arthritis on the fasting level of the blood sugar and on the response of these cases to the so-called glucose tolerance test. The glucose tolerance test was conducted according to the method of Hamman and Hirschmann. In the present series the renal threshold for glycosuria fell between 0.17 per cent. and 0.18 per cent., which agrees with the values found by others for the normal kidney, and is something of an argument for the normality of renal function in arthritis, as the threshold may be much higher in true nephritis.

Glucose tolerance tests were first conducted on a series of chronic arthritic patients, beginning with the most severe types, and as it became apparent that there was in most of them a marked difference in their response, our observations were extended to a large number of cases of all types. In general, it can be said that the height of the sugar curve, that is to say, the degree to which the sugar tolerance is lowered, is largely proportional to the severity of the active process *per se*. Severity of the process apparently plays as big a rôle as does the extent of the process in affecting the tolerance. Some of the curves fall within or only slightly above normal values. Ordinarily these exceptions occur in patients who have passed the zenith of their trouble and who show a tendency to convalesce, or they occur in cases in which the distribution and severity are limited. But the parallelism is not exact. It should be borne in mind that the glucose tolerance test is merely a gross way of ascertaining deviation of a function which is probably complex and dependent on factors not understood, and that it is not necessarily adjusted to reflect lowered tolerance in all cases.

A group of twenty convalescents was then studied. These had had a severe and generally long continued arthritis and at the time were free from symptoms. It was found that this group gave curves of a lower average than the severe or moderate cases; that is, 74 per cent. of the group of convalescents gave a normal tolerance.

Investigating the relation of this disturbance to some of the other factors known to influence chronic arthritis, we conducted a series of determinations on the tolerance during the ill health and convalescence of the same person, following various procedures. It was found that there was an abrupt change

in the sugar tolerance in patients who improved after removal of apparently causative foci of infection. Thus there was a striking contrast after twenty-nine days in the sugar tolerance of a soldier, the subject of intense arthritis of long standing in the left hip and foot, who made an abrupt and rapid convalescence following tonsillectomy. A curve showing normal tolerance was obtained fourteen days after the tonsillectomy.

The group of men convalescing in the presence of demonstrable surgical foci of infection suggests that the disturbed tolerance may return to normal as the patient improves, even without the removal of the focal infection. At least five persons giving normal tolerance curves were the subjects of demonstrable surgical foci. One case (Case 22) illustrates a distinctly lowered sugar tolerance (high curve) observed in a patient who later made striking improvement, because of a sharp dietary, in the presence of a surgical focus. The curve next to the highest was that obtained when this soldier was at the height of his trouble, which consisted in almost complete ankylosis of both hips, knees and spine, together with great limitation of function in the left shoulder. The third and fourth highest curves were obtained when the shoulder had made an emphatic therapeutic advance following diet. The lowest curve represented the return of the sugar tolerance to practically normal limits, following the removal of necrotic tonsils, after he was well on in convalescence and able to walk with crutches.

Therefore it seems clear that as patients with arthritis improve, irrespective of the therapeutic measure to which this is due, the lowered sugar tolerance tends strongly to a return to normal. It seems to do so most rapidly, however, after surgical removal of the causative infection. Our experience suggests that the sugar tolerance test may sometimes be helpful to indicate whether all foci have been removed; for example, a case of active arthritis of moderate chronicity may fail to improve after the removal of dental foci. If the tonsils in such a case are apparently normal, as often happens, the maintenance of a definitely lowered sugar tolerance would suggest that foci are still operative and presumably in these tissues. It must be borne in mind that long standing cases from which all demonstrable foci have been removed may retain their lowered tolerance.

Among three supposedly healthy persons, the subject of marked tonsillar pathology without symptoms, one curve was slightly elevated above the normal, and the others fell within normal limits. One of these patients showed such gross pathology that his tonsils were removed a day or two later as a prophylactic measure. It is important, therefore, to note that, by and large, the disturbance of the sugar tolerance, as here considered, due to focal infection, apparently accompanies the failure of the organism to maintain successfully its wall of defense and is apparently restored to normal when this defense returns. In this light a lowered tolerance, following a focus, becomes an intermediary, or, at least, a concomitant step in the pathology of arthritis and possibly other conditions as well.

Lowered sugar tolerance is specific for no disease and has been noted in a variety of conditions. It is important that the results of sugar tolerance tests in as many different diseases as possible be recorded, and there were, therefore, included in the present study determinations of the sugar tolerance in twelve cases of miscellaneous disease at large, as they presented at the hospital. These showed that patients with severe arthritis gave the highest curves, the miscellaneous pathologic cases the next highest and patients with moderate arthritis the next; the mild and convalescent arthritic patients fol-

lowed with curves of about the same height; the curves in the normal cases being the lowest. It is probable that selection could be made of certain types of miscellaneous pathologic cases which would determine such a composite curve at either a higher or a lower level, according to the groups chosen.

It has generally been believed that, with the exception of disease of the pancreas, disturbances of the thyroid are the most common cause of altered carbohydrate tolerance. However, even in hypothyroidism sugar tolerance shows perplexing combinations, although in a general way low in hyperthyroidism and high in hypothyroidism and individual patients display wide latitude in their responses. The same conditions obtain in disturbances of the hypophysis. It has also long been known that in nephritic patients the blood sugar often is unusually high. However, as Hamman and Hirschmann remark: "It is not always high; sometimes it is at the normal level, and why some cases have hyperglycemia and others have not has never been satisfactorily explained."

It would seem in the light of the evidence herewith adduced that lowering of the sugar tolerance, as exemplified by the glucose tolerance test, rests, in part at least, on somewhat more fundamental pathologic processes than has hitherto been suspected. It seems to stand in some relation to inflammatory processes and it appears from the data adduced herewith that the presence of an inflammatory process may induce a lowered sugar tolerance; that is, a high curve. Other curves definitely prove that marked reduction of sugar tolerance may abruptly return to normal after the removal of a focus of infection. It is possible that some departures from normal observed in studying nephritis, thyroid and hypophysial disorders, etc., are referable to such agencies as focal infection. This applies, of course, to the miscellaneous diseases the authors have studied and suggests the inexpediency of extending such observations unless carefully controlled. Thus a high curve afforded by a case of plumbism may have been due to a focus that we did not suspect.

A lowered sugar tolerance, as measured by the glucose tolerance test, seems to be a more common occurrence than has been appreciated. In view of the demonstrated relation of focal infection to sugar tolerance; in view of the frequency of foci in arthritis and at large; in view of the frequency of arthritis as a disease and the frequency with which it is accompanied by a lowered sugar tolerance, it seems necessary to modify the view which ascribes to disturbance of thyroid function, next to diseases of the pancreas, the most common cause of altered carbohydrate tolerance. It is clear, however, that most arthritic patients are unable to remove from the circulating blood, as does a normal person, the carbohydrate that reaches it from the gastro-intestinal tract.

IV. STUDIES IN THE RELATION OF CREATIN METABOLISM TO ARTHRITIS.

Ralph Pemberton and Thomas E. Buckman, Arch. Int. Med. **25**:335 (April) 1920.

The researches of the past fifteen years on the chemistry and biochemistry of creatin and creatinin have abundantly established the high importance of these substances in the animal economy. More or less characteristic glucose intolerance has been demonstrated by Pemberton and Foster in cases of arthritis. As creatinuria has been demonstrated in hyperthyroidism (after high protein feeding) and in other conditions accompanied by a disturbance in the body's capacity to utilize carbohydrate, it was deemed worth while to investigate a series of arthritic patients with a view to determining the presence of abnormalities in the metabolism of creatin as revealed by blood and urine analysis.

Summary.—1. In determinations of the creatin, creatinin and nonprotein nitrogen of the blood and urine of forty cases of arthritis and in nine normal patients used as controls, about one-half of the cases of arthritis showed an abnormally high value for blood creatin.

2. A certain number of patients showed a decline in blood creatin simultaneous with clinical improvement.

3. Only three of the cases showed creatinuria.

4. Only two cases showed abnormal elevation of nonprotein nitrogen of the blood.

V. ROENTGEN-RAY EVIDENCES, CLINICAL CONSIDERATIONS, TREATMENT, SUMMARY, CONCLUSIONS AND CLINICAL ABSTRACTS OF CASES STUDIED. RALPH PEMBERTON, Arch. Int. Med. **25**:351 (April) 1920.

Roentgen-Ray Evidences.—Roentgen-ray studies were made in all cases of the 400 in which there was any suspicion that there might be additional evidence discoverable by these means. One hundred and seventy-nine series of plates were made, ranging from one to twenty plates in any given series, and the percentage of positive findings justified omitting recourse to the roentgen rays in the absence of such suspicion. Making allowances for cases which may have been overlooked, a relatively small number of the entire series, less than 15 per cent., showed evidences of bony change when examined by the roentgen ray. It is clear that arthritis and its accompanying phenomena may exist for many months, producing gross superficial changes, without evidence that the roentgen ray can detect, except in the increased shadows of the soft parts.

Clinical Considerations.—Cases occurring under military conditions differ from those in civil life chiefly in respect to the age, the immediately exciting factors and the greater tendency to improve. Nearly all types encountered in civil life were represented, although the incidence was different. The age of the patient and the relatively limited chronicity of the disease precluded the occurrence of gross lesions of the degree and frequency encountered in the later decades of life. Although chronic arthritis in the young is not rare, and some of the most refractory cases occur at this age, its frequency is vastly increased by war conditions.

On account of the lesser frequency of structural bony change, it was sometimes difficult to decide as to the existence or degree of disability. Cases involving the spine and sacro-iliac joints presented the greatest difficulty in diagnosis. The minor neuroses secondary to illness and war conditions often complicated the picture. A certain number of cases showed acute tenderness to pressure at and below the costal borders posteriorly, suggesting, but not simulating, lumbago.

A small number of cases called to mind the picture presented by certain supposedly neurotic conditions, unaccompanied by organic change, in which the individual bends forward as though the subject of advanced vertebral disease. Under the heading "camptocormie," "spondylose antalgique" and other titles, the French have directed considerable attention to this condition, and the diagnosis between it and spondylitis deformans is acknowledgedly difficult. We concluded that in the presence of disabilities referred to the back as a whole, it was unsafe to deduce without prolonged, exhaustive observation that organic disease was not present.

The exciting factors other than exposure need a little comment. It is somewhat surprising that dysentery should occupy the second place. The arthritic attack came on at all stages of the apparently causative disease, even occasionally nearly or quite coincident with convalescence, when the conditions of life were not adequate to explain it.

It is, of course, entirely possible, theoretically, that when exposure acted as the exciting agent in producing arthritis, it did so through the intermediation of a focus of infection by lowering the general resistance to such infection or by favoring the growth of such a focus. We believe that the question is not yet settled and that we must admit the possibility that exposure per se is capable of inducing "rheumatic" disability.

It is difficult or perhaps impossible at present to draw a line sharply between chronic arthritis which includes occasional acute febrile manifestations and acute inflammatory rheumatism per se, and several cases of this series appeared to merge from one condition into the other. In acute inflammatory rheumatism circulating bacteria may cause valvulitis, emboli and sepsis; and true sustained inflammatory rheumatism with valvulitis is probably due to bacterial infection only. In both conditions the arthritic phenomena probably result from some common intermediary step, such, for example, as that productive of a lowered carbohydrate tolerance secondary to focal infection or other agencies. The chronic and acute types differ in degree rather than in kind.

Treatment.—A large number of patients were recovering on admission or had recovered following nothing more fundamental than rest and external measures, notwithstanding severe and protracted invalidism. These facts, together with our own experiences, forced on us consideration of the results obtained by the expectant plan of treatment when based on such measures as baking, massage, hydrotherapy, electricity and the like. They were much more encouraging than those encountered in civil life. The kinds of treatment that received greatest emphasis were, first, removal of foci of infection, and second, local and external measures. Other forms of therapy figured less conspicuously. Thirty-four patients, or 8.5 per cent., recovered after the removal of foci. Thirty-one patients, or 7.75 per cent., improved after the removal of foci, but the end-result may have been favorable in certain unimproved cases that disappeared early from our observation.

This series has clearly indicated an impressive independence of focal infections as compared with older subjects. But it must be granted that the conservative step in a refractory case is removal of focal infection, and apparent normality of the tonsils is not unfailing evidence that they are not acting as focal agents. For practical purposes it is wiser to regard the relative independence of focal infections shown by these young subjects as an academic consideration, and to regard possible foci of infection as causative agents until proved otherwise.

The removal of dental foci also played an important rôle, but improvement was rather more striking after tonsillectomy. Genito-urinary disease afforded only a small percentage of the foci.

Nonspecific Protein Injections.—This form of therapy, as applied to arthritis, achieves its best results in the acute forms. The patients in the present series, to whom this treatment was given, belonged for the most part in the chronic category. The army typhoid vaccine was used in an initial dose of twenty-five million, the second dose, when given, being fifty million and the third, seventy-five million. Nineteen patients received nonspecific protein injections in a vein of the arm. Of these, seven were definitely improved, ten were unimproved

and in two the results were uncertain. Although nonspecific protein in the form of typhoid vaccine is of some benefit on diffuse groups of arthritic patients, the subcutaneous injections, as practiced routinely in the army camps on the incoming draft, have been without effect to prevent rheumatoid disabilities. Some men had received as many as fifteen injections of the typhoid vaccine prior to the onset of arthritis.

Dietary Considerations.—It has been pointed out in previous contributions that treatment by these dietary measures (sharp curtailment of food intake) should be reserved almost exclusively for cases demonstrably not caused by infectious foci, cases in which the removal of foci is contraindicated, cases not accompanied by under nutrition, anemia, etc.

Case 1.—Robbins, aged 25 years, had suffered from an attack of inflammatory rheumatism nine years previously. After some disability in one shoulder for more than two months, he developed a painful and swollen left ankle. Observations of the food intake for a period of about a week showed ingestion of about 3,750 calories per day, including about 700 calories from candy. Of this, about 12 per cent. came from protein, 29 per cent. from fat and 50 per cent. from carbohydrate. December 3, he was placed on a diet of 2,051 calories, of which about 10 per cent. came from protein, 52 per cent. from fat and 38 per cent. from carbohydrate. Four days later he was much improved. After eleven days the improvement was very marked. After this abrupt change there followed gradual and progressive improvement. His food was then increased to about 2,500 calories, of which about 8 per cent. came from protein, 62 per cent. from fat, and 30 per cent. from carbohydrate. At this point he was apparently in perfect health. The sugar tolerance displayed by this patient on four occasions illustrates that a lowered sugar tolerance may return to normal, coincident with improvement of the individual by restriction of diet.

Local and External Measures.—The subjects of this study showed a surprising response to local and external measures, comprising chiefly baking, massage, hydrotherapy and electricity. These measures all have at least one element in common: the induction of hyperemia. And their field of application is properly in cases which tend to recovery, cases of mild degree and cases in which the basis of convalescence is already laid. They can also be used with propriety in adding to the comfort of more severe refractory types in which, however, their curative effect is slight or absent.

Conclusions.—1. Soldiers developing chronic arthritis have had previous attacks with a frequency about five times greater than have soldiers admitted to hospital for other conditions.

2. Exposure was the exciting factor in 58 per cent. of 400 cases studied. There were apparent foci of infection in 72 per cent., but the present group showed a considerable independence of it. Forty-six per cent. recovered in the presence of demonstrable surgical foci. This is nearly three times the number that improved after the removal of foci. The tonsils were most frequently the site of infection, the teeth were next, the genito-urinary tract came last and clearly played an almost negligible rôle.

3. The sites of most frequent involvement were the knee, the ankle, the hip and the shoulder. All things considered, however, it is not clear that trauma to weight bearing parts played a much greater rôle than it does in civil life in determining the site involved.

4. The basal metabolism was found to be normal in 80 per cent. of twenty-nine cases studied. In 20 per cent. it was slightly below normal limits.

5. The carbon dioxid combining power of the blood; the total fat; the cholesterol and the calcium of the fasting blood were found to fall within accepted normal limits.

6. About one-half of forty cases of arthritis studied showed an abnormally high value for blood creatin. Certain of these showed a decline in blood creatin coincident with clinical improvement.

7. The urea of the fasting blood in seventeen cases fell within normal limits. The nitrogen of the fasting blood in sixty-seven observations in fifty-seven cases fell within normal limits, with two exceptions.

8. Studies of the renal function, in thirty cases of arthritis of widely different types, gave results that fell within the accepted ranges for normal persons. When compared with nine normal persons under similar conditions, there is evident a slight lag in the elimination of water, nitrogen and particularly of salt.

9. A lowered sugar tolerance was found in a large proportion of cases. This lowered tolerance accompanies the great majority of severe cases and is roughly proportional to the activity of the arthritic process per se.

10. The return to normal is apparently independent of the type of therapy employed, but is most abrupt after the removal of causative foci of infection. In certain severe chronic cases from which all demonstrable foci have been removed, a lowered sugar tolerance seems to persist.

11. Apparent foci of infection, unproductive of systemic effects, are not necessarily accompanied by a lowered sugar tolerance. A lowered sugar tolerance from focal infection apparently accompanies the failure of the organism successfully to maintain its wall of defense. In this light a lowered tolerance becomes an intermediary step in the pathology of arthritis and possibly other conditions as well.

12. A lowered sugar tolerance seems to stand in relation to many infectious or inflammatory conditions at large, and to depend on more fundamental pathologic processes than has been appreciated. It is also of more common occurrence than has been recognized.

13. The lowered tolerance observed in some diseases and referred to them may sometimes have been due to focal infection rather than to the diseases under consideration.

14. Critical examinations of recruits for a history of previous attacks of arthritis would reveal cases most likely to develop it. It is reasonable to believe that rejection of this group or at least the worst cases in it would reduce the incidence of arthritis in the army. A more conservative policy would segregate such patients, examine them for foci of infection and remove such foci when found. This would have the added importance of prophylaxis toward the civil community.

15. Local and external therapeutic measures have unexpectedly large application because of the tendency of this group to improve under favorable conditions.

In some cases of this series six months or a year were needlessly lost. Earlier and more critical attention to focal infection as a basis, together with a large coincident use of local measures, would probably afford the routine therapy best adapted to reach the greatest number of cases and should importantly curtail the existing invalidism. Many patients would require more individual attention, however, such as treatment by nonspecific protein injection or a restricted diet.

16. Experience with treatment by a restricted diet corroborates the conclusions previously published. Such therapy finds additional support in the studies on blood sugar, revealing difficulty in the utilization of carbohydrate. It seems clear that success following this measure depends on catering to a weakened function of which the lowered sugar tolerance is one evidence. Treatment along this line has undoubted application in appropriate cases of chronic arthritis.

17. The several measures of value in arthritis should be combined in their application to the present group more frequently than obtains in the treatment of cases in civil life. The tendency to focus on one measure often results in failure where the subsequent coincident use of several measures results in benefit.

AUTHOR'S ABSTRACT.

AIMS OF BIOCHEMISTRY OF THE NERVOUS SYSTEM. GIACOMO PIGHINI, Neurol. Bull. 2:395 (Nov.-Dec.) 1919.

Professor Pighini's article is an up-to-date résumé of the work done in the biochemistry of the nervous system, so that the task of condensing an abstract is of somewhat questionable worth; but in view of the interest of the subject an attempt is made to present a few of the salient facts.

After pointing out the limitations of the anatomy and histology of the nervous system and the fallacious information offered by the staining reactions, Pighini speaks of the chemistry of colloids and of the promises which physical chemistry makes in researches on the nervous system. By means of fractional extraction of the lipoids it has been shown that they constitute two thirds of the solids of nervous tissue. The water content is high, 77 per cent. "The formula of percentages of the lipoid groups is constant for every species and for every segment of the examined organ." The cholesterin which exists free and is not combined with fatty acids amounts to 10 per cent. of the total solids. Of the lipoids which have been isolated Pighini mentions leukopolin, cephalin, sahidin, sphyngomyelin, phrenosin, cherosin and cerebroses, or sphyngogalactoses. Of the other solids, the proteins, there are three different globulins, nucleins and amino-acids. The extractives consist of purin derivatives, galactose and inosite.

The gray matter contains a specific nucleoprotein which is absent in the white matter; other substances common to both show only quantitative differences. The gray matter is poorer in lipoids, has less cholesterin and phosphids, much less lipoid sulphur, but more nucleoprotein, neutral sulphur and water. The pons and medulla are rich in nonsaturated phosphids and poor in saturated phosphids. Even the various tracts are said to show differences. As the brain develops the neurons lose some of the water content and gain in lipoids.

These analyses throw light on the chemical reactions of the nervous tissue in health and disease and help to explain the changes in staining reactions. They may also indicate the probable chemical and physical, or biochemical reactions normally going on. Attention is called to the relatively constant (quantitatively) cholesterin, to its rôle as a fixer of the phosphorated lipoids, to its elective fixation of toxic products and to its maintenance of tension of solvents. Cephalin has the property of absorbing oxygen; other sulphurated proteins also participate in the respiratory exchange. Cholesterin, phrenosin or protein fix or neutralize the tetanus toxin; cephalin seems to fix the diphtheria toxin. Lead has a predilection for the ganglion cells of the bulb and pyramids, strychnin for the anterior horns, cocain for the posterior horn, and

anaphylactic poisons for the bulb. Elective fixation seems to exist in the case of anesthetics, narcotics, hormones, toxins and animal poisons—all probably on a chemical or chemicophysical basis.

Biochemical studies have been applied in several diseases of the nervous system. Mott and Mann have demonstrated the disappearance of nucleoprotein in amaurotic family idiocy and sought to correlate the fact with the disappearance of the Nissl bodies in the ganglion cells. In dementia praecox Koch and Mann and Pighini found a diminution of neutral sulphur and increase of proteins and inorganic sulphur, also a diminution of lipoid, except cholesterin, and an increase in water. In general paresis there is a decrease of lipoid phosphorus, of the cerebroses and the unsaturated phosphids, while the cholesterin remains constant and the water is increased. Pellagra shows general increase of water, decrease of the lipoids, cerebroses and phosphids, a relative increase of the cholesterin in the cerebellum with slight decrease in the brain and cord, relative preservation of the proteins, a considerable increase of the extractives and a loss of neutral sulphur.

As the degenerative changes in the cells generally seem to follow a definite pattern, chemical analysis will ultimately throw light by means of qualitative and quantitative determinations.

As to chemicophysical behavior, cholesterin does not show the colloidal relation to solvents (chloroform, ether, alcohol, carbon bisulphid, etc.) which cephalin, lecithin and cerebrosids do. Cholesterin raises the superficial tension of organic solvents such as anilin, benzoic acid and naphthalin, while the phosphatids and cerebrosids lower the tension. Various lipoids react differently in the matter of aiding absorption.

Pighini puts forward two hypotheses as to the action of disease products on the nervous tissue. "a. That the pathogenic agent alters definite diastatic agents in the nervous system. b. The pathogenic agent splitting off into aqueous and lipoprotein emulsions becomes attached to certain lipoid components of the protoplasm by chemicophysical means." Narcotics seem to provoke chemical modifications in the brain which show increase of water and diminution of cholesterin.

Pighini outlines the field of investigation and points to the close connection of mineral and hormonic exchange, to radio-active substances in the brain, to ionic action and to the phenomena of polarization and depolarization of cellular elements. He refers to the chemical anatomy or histochemistry of nervous tissue, cellular and plasma fluids, to the superficial energy and tension of the electric potential, to the force and direction of the liquid crystalline molecule, to the dielectric and electromotor force. Through these, he hopes, one will be able to explain the origin of impulses, the manner of their conductivity or interference, and, finally, by means of thermodynamic laws, even psychic energy will be understood.

WECHSLER, New York.

A CASE OF DIFFUSE CEREBROSPINAL SCLEROSIS. S. UYEMATSU, J. Nerv. & Ment. Dis. **51**:6 (June) 1920.

Dr. Uyematsu reports a case which presented the following symptoms of diffuse sclerosis: The patient had a "stroke" eighteen years before death, followed by eight weeks of aphasia. After this period, there was no speech defect, but she had a slight limp which remained. At 38 she was committed as insane with a diagnosis of manic-depressive psychosis, and showed periods of depression and exhilaration. She had some memory defect and poor insight at the periods of remission. At 48, she was admitted to the Danvers State Hospital showing a positive Wassermann, slight asymmetry of the face and

hyperactive reflexes. In a number of years she became demented, gradually weakened, and became indifferent and apathetic. From her forty-sixth year she had occasional fainting attacks followed by unconsciousness. At 49, a tentative diagnosis of paresis was considered, but the spinal fluid was persistently negative. Dementia praecox was also considered as a diagnosis, but never made definitely. She gradually failed physically and mentally until her death.

At necropsy the brain weight was 870 gm. Small cysts were found in the right frontal convolution, in the internal capsule on the right and in the pons. Areas of softening were located in the second frontal convolution, the large part of the centrum semiovale, the internal capsule of the right side and the left lenticular nucleus and internal capsule, and in the pons between the pyramidal tracts and lemniscus bilaterally.

Microscopically, the striking features were alterations in the myelin sheaths and glia cells. In the areas of softening, there was incomplete myelin degeneration and the line of demarcation between the softening and normal tissues was indistinct and irregular, contrary to the usual condition found in diffuse sclerosis. The myelin sheaths seemed to have degenerated hand in hand with the axis cylinders, and in the areas of cyst formation both had entirely disappeared. Pyramidal tracts showed secondary degeneration.

The glia changes were the most important findings. The glia cells were enormously increased throughout the whole central nervous system, their nuclei were unusual in size and shape. In the superficial cortex layer, spider cells, small cells and rod cells were found. In the 3-4 cell layer large numbers of rod cells were present with abnormally elongated nuclei having rounded ends. In the deepest part of the cortex short rod cells and small round nuclei of various forms were numerous. Many rod cells occurred as satellites of ganglion cells and showed no direct relationship to the vessels.

Commenting on the literature concerning rod cells and their origin, the author believes in a gliogenous theory because:

1. They are found together with abnormally increased glia cells.
2. There are all the transitional forms between rod and glia cells.
3. There are many satellite rod cells.
4. There is no proof of relationship with pial vessels.
5. They are found in the cortex where the vessel alterations were not remarkable.

In the peduncle, pons, medulla and cerebellum, the gliosis was most marked, the nuclei of cells assuming many varieties of size and shape. These changes are attributed to nuclear division. The cord showed gliosis throughout with atypical forms of rod cells.

Glial fiber formation was remarkable in the border of the cortex, around vessels forming an extraordinary protecting wall. In the region of the internal capsule and lenticular nucleus on the left side glial fibers occupied the entire area. The brain vessels were sclerotic, alterations being most marked in the circumscribed areas of the right side, but there was withal, insufficient evidence that the vessel changes were primary. The Purkinje fibers of the cerebellum were found sometimes in the molecular layer (a heterotopia), and the processes were much swollen.

The author discusses the differential diagnosis as between glioma and diffuse sclerosis, having ruled out paresis by the serologic tests and pathologic changes found. As to etiology, he concludes, on the basis of the hypoplastic conditions, that the underlying factor is congenital and that the proliferative process is primary, and the condition a true diffuse sclerosis.

PATTEN, Philadelphia.

LETHARGIC ENCEPHALITIS: SYMPTOMATOLOGY AND HISTOPATHOLOGY. E. M. Hammes and J. C. McKinley, Arch. Int. Med. **26**:1 (July) 1920.

The authors report observations in twenty-seven cases of lethargic encephalitis which followed the influenza epidemic of 1919-1920. The chief clinical manifestations noted were: gradual onset with severe and diffuse headaches, becoming persistent, asthenia, lethargy, muscular rigidity with masklike features, cranial nerve palsies—most frequently the third and sixth nerves—pupillary changes, temperature ranging from normal to 103.4 F., mental confusion—sometimes resembling one or another of the psychoses—persistency of the lethargy from weeks to months, and indefinitely.

The laboratory findings were quite uniform: blood, mild leukocytosis; spinal fluid, mild lymphocytosis (normal to 57 cells per c.mm.) and mild globulin reactions.

The pathologic and histologic changes varied somewhat, but in the main the general picture was that of congestion and edema, petechial hemorrhages, pigmentation, perivascular infiltration of round cells, proliferative changes in the endothelial and interstitial tissues, and degenerative changes in nerve cells and myelin sheaths. The entire nervous system showed involvement, but most marked changes occurred in the basal ganglions, midbrain, pons and medulla. Gross evidence of encephalitis was lacking except for congestion of meningeal vessels. The predominant cell in the brain tissue was the lymphocyte, but a few plasma cells were present. There was, in addition, some increase in the glial nuclei and satellitosis was fairly common. Around the root of the fifth nerve in one case there was marked perivascular and diffuse infiltration of small round cells and hemorrhage into the subarachnoid space; there were also found in this and other cases mononucleated cells which were undoubtedly actively phagocytic and probably of endothelial origin. All nerve cells in the areas of principal involvement showed evidence of some type of degeneration and marked pigmentation, the pigment filling the cell and by its staining reaction demonstrating a lipochrome material; this pigment was also found in the surrounding interstitial tissue. Chromatolysis was frequently observed.

The etiology of lethargic encephalitis was not established by the study of these cases, but the suggestive clinical relationship to influenza is emphasized. Note is also made of the profound general symptomatology and the less marked localizing symptoms.

Patten, Philadelphia.

MANIFESTATIONS OCULAIRES DE L'ENCEPHALITE LETHARGIQUE (OCULAR MANIFESTATIONS OF LETHARGIC ENCEPHALITIS). F. de Lapersonne, Presse méd. **28**:493 (July 21) 1920.

According to Lapersonne, the incidence of ocular symptoms in cases of lethargic encephalitis will be found much greater than 70-75 per cent., the estimate of Achard and Netter. He calls attention to the considerable number of ambulatory cases that are seen only by oculists, and to another group, not usually seen by oculists, in which palsies are not demonstrable in an ordinary neurologic examination but can be brought out by finer ophthalmologic tests. Aside from the common ptosis, he finds that internal rectus paralyses and uncomplicated paralyses of accommodation are frequent and often missed. Uncomplicated fourth nerve affections have not been reported.

Pathologic findings in the mesencephalon, suggestive of very frequent involvement of eye muscle function, are quoted from P. Marie and Tretiakoff, and from Lhermitte and Saint-Martin, who called the disease a "primary poliomesencephalitis with narcolepsy."

In general, the eye muscle palsies of lethargic encephalitis are noteworthy for their tendency to be dissociated, partial, fleeting, migratory and relapsing. A real myasthenic condition, rather than simple motor paralysis, would best explain the incompleteness, the absence of reaction (as forehead wrinkling in cases of ptosis), and the almost daily modifications. Another prominent characteristic is a tendency for ocular symptoms to persist after all others have disappeared.

HUDDLESON, New York.

TETANOS. FORMES CLINIQUES. TETANOS CEPHALIQUE. SEROTHERAPIE (TETANUS—CLINICAL FORMS. CEPHALIC TETANUS. SERUM THERAPY). C. ACHARD, Progrès méd. **35**:325 (July 24) 1920.

The author describes the clinical features of generalized tetanus and those special types of tetanus in which the contractures are localized; for example, there is a monoplegic form, a paraplegic form and an abdominal thoracic form. Of all the localized forms, the least rare but the best studied is the cephalic form. In it, apart from the head, the neurologic status is negative. Even neck rigidity is absent.

Cephalic tetanus is characterized by headache, fever, trismus and paralysis, usually of the facial muscles. It is generally occasioned by a wound of the forehead or other part of the face or head. It is made conspicuous by the mingling in close association of paralytic and contracture phenomena. The facial paralysis, often unilateral, or if bilateral, unequal in intensity on the two sides, is peripheral in type. Intrapetrosal localization was present in only one reported case. In that case, there were hyperacusis and disturbance of taste limited to the paralyzed side.

Facial paralysis is not the only paralysis seen in cephalic tetanus. Ophthalmoplegias, partial or complete, are sometimes encountered. In exceptional cases, hypoglossal paralysis is added to the facial ophthalmoplegic syndrome. It would appear that with these somewhat varied paralytic possibilities trismus must of necessity be present in order to permit diagnosis.

The writer mentions that the pathogeny of these special types of tetanus is far from clear and concludes with a discussion of the prognosis in tetanus in general and a brief summary concerning its treatment with serum.

DAVIS, New York.

ACUTE CEREBROCEREBELLAR ATAXIA. J. P. CROZER GRIFFITH, Am. J. Dis. Child. **20**:2 (Aug.) 1920.

This is a report of three new cases and a summary of one case, reported by the author five years before, of encephalitis occurring in children with predominent involvement of the cerebellum but also with cerebral signs and symptoms. In all the cases the condition came on fairly acutely, with stupor occurring in only one case (in which the author himself considers the diagnosis of lethargic encephalitis) with marked ataxia, unilateral or bilateral; with speech disturbance, which the author thinks might be due to "an ataxia of speech rather than a mental disturbance;" with disturbance of mentality; with nystagmus in only two of the cases and with an absence of vertigo.

The after-results are rather interesting: The first patient recovered absolutely; the second had incoordination persisting for more than three years after the attack; the third suffered nine months later slight mental retardation and some cerebellar symptoms; and the fourth recovered after four months. The case reported by Taylor, in 1904, is mentioned in which there were some symptoms three and a half years after the attack, but none twenty years later. The collected results from the seventeen previous cases reported shows that in the majority of cases the disease leaves no traces.

WINKELMAN, Philadelphia.

NOUVELLES RECHERCHES SUR LA CIRCULATION DU LIQUIDE CEPHALORACHIDIEN (NEW STUDIES OF THE CEREBROSPINAL FLUID CIRCULATION). V. STEPLEANU-HORBATSKY, Presse méd. **28**:254 (April 28) 1920.

On the basis of these studies, the experimenter concludes that the subarachnoid space with its ramifications constitutes a lymphatic system for central and peripheral nerve tissue. He finds evidence for three normal directions of flow in the cerebrospinal fluid: primarily, from the subarachnoid space through its continuation into perineural spaces, to lymphatics of the nerve sheaths, and thence by the usual lymphatic channels to the venous system; secondarily, directly into the venous circulation of the brain; and again, but apparently not always, into the lymphatics of blood vessel sheaths, and through the lymphatic to the venous system. The fluid gradually spreads from the center peripherally, and no evidence was found indicating a complete cycle of circulation.

Subarachnoid injections of Prussian blue in cadavers were used to demonstrate circulatory channels, but the chief interest of the paper lies in the verification and amplification of such findings by means of experiments on moribund infants. Each of four patients, ranging from 9 months to 11 years of age, was given a subarachnoid injection of 1 c.c. of a 5 per cent. solution of methylene blue by lumbar puncture. Necropsies were made from ten to forty-eight hours later.

HUDDLESON, New York.

PERIPHERAL NERVE INJURIES. J. F. CORBETT, Minnesota Med. **3**:422, 1920.

The author states that from 60 to 80 per cent. of patients with nerve injuries from war wounds recover with physiotherapy alone; the remaining 20 to 40 per cent. require surgery. If the condition is stationary for three months after the wound has healed, operation is indicated. Corbett then discusses the causes of so-called physiologic and anatomic interruption. In his case 102 days after healing was the average time of beginning of voluntary motion in paralysis of the musculospiral. In order to obtain spontaneous or postoperative recovery proper splinting is necessary.

In cases of anatomic interruption the nerve should be isolated above and below the scar, the scarred ends resected until normal fasciculi are encountered, the scar tissue from adjacent structures removed, and the ends of the nerve sutured with from three to seven interrupted sutures of fine linen or silk. Liquid petrolatum is placed about the suture line. Defects are corrected by posture of the limb or by insertion of grafts; the author favors the use of autogenous sensory grafts on account of their availability. The literature on nerve grafting, nerve crossing, etc., is reviewed.

All except two of the author's patients on whom suture had been performed showed signs of improvement and promise of ultimate recovery. One patient, on whom 7.5 cm. had been resected, showed return of function in five months.

OTT, Rochester, Minn.

OCULAR NOTES ON LETHARGIC ENCEPHALITIS, WITH TWO CASE REPORTS. GILFORD DICKINSON, Am. J. Ophth. **3**:8 (Aug.) 1920.

The author in his article cautions against the tendency that exists in diagnosis of ocular palsies to attribute them to syphilis. He reports two cases of ocular palsies which on first impression would be diagnosed syphilitic in origin. One patient showed a definite Argyll Robertson pupil and the other had a third nerve palsy. Serologic examinations in both cases, however, were entirely negative, and later a diagnosis of mild lethargic encephalitis was made by the neurologists.

The main features pointed out in the differentiation of syphilitic ocular palsies and palsies due to other factors as in encephalitis, are the longer duration in syphilis and the tendency for the same muscles to remain involved, whereas in encephalitis the palsy shifts from one muscle or group of muscles to another, and is of comparatively short duration, the third and sixth nerves being most frequently affected.

PATTEN, Philadelphia.

ACUTE INFECTIOUS MYOCLONUS MULTIPLEX AND EPIDEMIC MYOCLONUS MULTIPLEX. J. RAMSAY HUNT, Neurol. Bull. **2**:391 (Nov.-Dec.) 1919.

Hunt describes a special "clinical type" of disease which is characterized by lancinating pains, muscular contractions and twitchings, and a delirium of toxic origin. He cites eight cases, two of which occurred sporadically, in 1904 and 1914, respectively, and six recently. The onset in all cases was with fever and severe pains in the lower extremities, later myoclonus and myokymia, particularly of the abdominal muscles and lower limbs, and finally delirium of a toxic infectious nature. Hunt seeks to distinguish this clinical entity from other acute infectious diseases, from peripheral neuritides, from chorea, from acute poliomyelitis and from Dubini's disease. Epidemic encephalitis is considered as a probable etiologic factor.

Cases such as Hunt has described have been frequently encountered in the course of the epidemic, and numerous reports on this variety of radicular meningomyelo-encephalitis have appeared in the domestic and foreign literature. One must take exception, therefore, to the special name which he has chosen for the clinical syndrome.

WECHSLER, New York.

Society Transactions

AMERICAN NEUROLOGICAL ASSOCIATION

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WOUNDS OF THE HEAD IN CIVIL LIFE. Dr. Charles L. Dana. This article appears in this issue.

DISCUSSION

Dr. Francis X. Dercum, Philadelphia, said Dr. Dana's paper applied not only to injuries of the head, but also to injuries of every portion of the body. It was a state of mind in the patient that gives rise to what is termed in the German literature "compensation hysteria." We have, unfortunately, in this country followed the method of compensation practiced in Germany. The compensation statistics in Germany were appalling before the war. What they are now of course he did not know, but in the Germany known to us previous to the war only about 9.3 per cent. of the patients with an injury presenting functional nervous troubles ever returned to work. The consequence was that compensation in Germany grew to enormous proportions. This was because of the method with which compensation was applied. Weekly sums were paid—doled out—extending, as with ourselves, over many weeks of time; and after the expiration of a certain period, about a year, the claimant had the right to apply for another examination, at which examination he was always found to be worse. As a consequence, the compensation was always raised, never lowered. At times a necessity for special forms of treatment was claimed, for which increased compensation was allowed; at other times even a special personal attendant was claimed to be necessary and the increased expense allowed. Not infrequently, it may be added, the attendant thus allowed and paid by the state proved subsequently to be a member of the family already otherwise employed.

If our attention is turned to Denmark, where the principle of a complete cash compensation, definite and final, is followed, we find that instead of only 9.3 per cent. of the patients with traumatic neuroses returning to work, 93.6 per cent. return to work. About four years ago Dr. Dercum wrote a small book on this subject, entitled "Hysteria and Accident Compensation," published by the George T. Bisel Company, Philadelphia.

The facts, Dr. Dercum repeated, were indisputable. The patient usually made a recovery from a physical injury from which he may have suffered, but the fact that compensation often extended over hundreds of weeks resulted in the fact that the claimant never recovered as long as compensation lasted. All of us have these patients with traumatic neuroses in our clinics, treat them in every possible way and yet cannot make them well. The only way to deal with them would be to change the method of compensation. It is a notorious fact that the functional nervous patients seeking damages in the courts resist every form of treatment, but that all medical treatment ceases with the settle-

ment. The symptoms then disappear, the patient forgets all about them. He had placed a large number of such cases on record in the book just referred to.

Finally Dr. Dercum said that the method of immediate, complete and final compensation, the Denmark method, was the fairest, the kindest and the best for the injured person. The latter is paid a lump sum, and he held that the state had no right to withhold this sum in any part or to dole it out in such sums—often pitiably small—as the officials thought best. It is readily conceivable that the man who has been injured—or believes himself to have been injured—is obliged, in order to make himself a fit subject for compensation, to maintain his symptoms and to be ill for the specified length of time. In Denmark the extent of the injury is determined by a board of physicians, compensation is prompt and the matter concluded. The patient can invest his money or do what he pleases with it, but the significant fact is that sooner or later he returns to work.

Dr. Theodere Diller, Pittsburgh, thought that in the Government War Risk Insurance there was a better plan in operation than in the State Boards of Workingmen's Compensation. In the war risk insurance, with which he had some familiarity, the plan is something like this: A soldier who is unable to work on account of nervous symptoms following injuries in the war receives $80 a month; that is, if he is unable to work. If he is partly able to work he receives one half or one quarter of this amount.

He had examined many of these men in the last year and divided them grossly into two classes, dependent fundamentally on their temperaments, those who when possessed of severe nervous symptoms, such as Dr. Dana described, stay put and the others who look forward. There are those who look backward and within, and those who look forward and without. These groups run into each other very much, but still it is rather useful to make this broad division. The ones that look forward can be helped a great deal, and the government has a good way of doing it. If a man says that he cannot work, that he cannot do this or that, the government says, "All right, we will give you lighter work." For instance, the man who complains that his work as a carpenter is too much for him is sent into a greenhouse, or he takes up some other light work, and is put on to harder work as he is able to do it. With encouragement, there is a great deal that can be done in that way. With the other class—those who look in—it is hardly possible to accomplish anything. They are always complaining that it is the government who has done this and has caused all this and shall be made to pay for it. It is hard to do anything with that fundamental condition of temperament. Dr. Diller said that giving a man a little work to do and encouraging him to do more would prove as valuable in the cases mentioned by Dr. Dana as it has proved in the government's cases.

Dr. Harvey Cushing, Boston, said he felt much troubled and disturbed by Dr. Dana's paper on this subject. He felt that we know very little about these cases. He did not believe that these symptoms occurred only in people engaged in litigation. It may have appeared so before the war, partly because most people who have injuries of the head (and it is those injuries we are speaking of, not injuries in general) were usually of the laboring classes, and not intellectual people. On the other hand, we must remember that people with such injuries who have intelligence often do not persist in consulting physicians because they see it does no good. However this may be, poor people with the complaints we designate as post-traumatic neuroses formerly appeared to be the more numerous. But the war has changed all this. He thought that a

cerebral injury, no matter in what walk of life the person may be, may produce these symptoms. Soldiers who have been victims of cerebral injuries represent, in the long run, men who are not afflicted with litigation neurosis. They are seriously damaged by these injuries. They are incapable of carrying on their former work, even though there are no localizing symptoms. He did not see why Dr. Dana felt that if you cannot determine some definite local lesion, there had been no damage. These unfortunate people are left with disturbances in mentality which affect their memory, disposition and powers of concentration. They are in consequence often unable to engage in their former occupation. It may be called a functional neurosis, but it is a very definite thing. He did not think we could smooth this over, or excuse ourselves by saying that these people must not have compensation because they will not go to work. Most of these patients whom he saw were eager to go to work and made frequent attempts to do so, but they broke down under any mental strain.

Dr. Cushing had visited a hospital in England where anywhere from 200 to 300 patients, who had not been operated on, were lying, and the attendant asked him what could be done. The patients had headaches, vertigo, a sense of incapacity, and were unable to carry on their occupation. They were fairly comfortable if left in bed. They should have been operated on at the time of the injury, and that was the result. Then he had gone to another hospital and had been asked again, "What shall we do? These people have been operated on, but have holes left in their skulls. They are subject to headaches, have dizziness, vertigo, mental confusion and the old familiar traumatic neurosis syndrome. The trouble is that they have been operated on, and we must now close the cranial defects left in their heads."

Dr. Cushing said that all these people had had a serious damage to their central nervous system, and he believed that they were just as badly crippled as if they had lost their legs. The people who had lost their legs get the compensation, and the people with serious mental disturbances do not. It is the kind of disability one cannot weigh or measure by ordinary standards, but it is a very real thing. Unquestionably it is a condition easily simulated. It is a state, moreover, on which a marked functional superstructure of symptoms may develop. Nevertheless, a large proportion of the victims of serious cerebral contusions are permanently handicapped and must pursue their former occupation with lessened intellectual vigor and staying powers.

Dr. Edward B. Angell, Rochester, said that he had a good deal of success in the treatment of some of these cases with a very simple method. For those who were interested in the matter sufficiently to follow it out, he thought that one would be able to clear up a large majority of psychasthenic or neurasthenic patients in this manner. If the urine of such patients is placed over nitric acid, a pigment ring will result. When you have this with the other chain of symptoms, it means that there is a depressed tone of the mind. Analysis of the neurologic symptoms will show that along with this depressed tone there are disturbances of metabolism, usually due to toxemia. By clearing up that pigment ring one will find that the patients forget their troubles. This can be done with plenty of bicarbonate of soda between meals and sodium salicylate in 10 grain doses after meals. It is a simple method and usually efficient.

Dr. Dana said that these people have not much subconscious mind. On the contrary, Dr. Angell believed that it was all the mind they had. They had no reasoning power, for rational argument was of little avail in controlling the neurosis.

Dr. Bernard Sachs, New York, said his sympathy was almost entirely with the attitude taken by Dr. Dana and he wanted to express his dissent from the position assumed by Dr. Cushing. He did not think Dr. Cushing realized what kind of cases they had to deal with in New York, where the situation was extremely serious, and demanded serious attention. He felt that neurologists should stand together and adopt some uniform policy, particularly with reference to court cases.

Dr. Cushing was right in that there is a certain amount of injury in brain cases which is tangible—not intangible—which has been done to the brain. These are not the cases, however, which Dr. Dana had in mind, and the cases on which some immediate decision had to be taken. Dr. Sachs said there was a large number of persons who received slight injuries of the head, but from the fact that the injury had been to the head (and most people seem to appreciate that part of the body more than any other) they at once became imbued with the idea that some serious injury had been done. They constituted a large proportion of head injuries which were dealt with in court before the State Industrial Commission.

Dr. Sachs had tried to be just and to assure adequate compensation to the workingman and to play fair with him; but he admitted that the impression remained that the workingman's apparent psychosis or mental attitude was due first of all to the intense fear that he was not going to be able to continue to earn his livelihood. That was the predominant factor in his mental make-up for the time being. Dr. Sachs had not been able to escape the conviction that in the vast majority of cases it was the desire for compensation. He thought the common sense attitude of all neurologists toward this will have to be that it is the desire of compensation that often prevents these people from getting well. He thought that it should be recommended that compensation should depend on a return to work. He had appeared before the State Industrial Commission and presented that point of view, that is, to induce the workingmen to return to work and tell them that their compensation would be increased if they returned. He wanted to get away from any maudlin sentimentality that we were unfair. We are all prone to do all we possibly can in favor of the workingman, but unless he returned to work of one kind or another, Dr. Sachs feared we would have a large number of idlers on our hands for many years to come.

Dr. Foster Kennedy, New York City, asked Dr. Cushing on what authority he stated that all people who had head injuries and had symptoms afterward had vasomotor disturbances. It did not seem to him to be a scientific statement, and he would like to have the evidence. Dr. Cushing seemed to neglect the evidence that injury rendered a man liable to suggestion, and it was this that precipitated many of the symptoms and perpetuated them.

Dr. Kennedy further said that Dr. Cushing perhaps had noticed some of the reports, brought out by Wilfred Trotter, who had treated cases of bone defects of the skull by taking bone grafts from the tibia, and entirely cured the bone defect. These men, both privates and officers, had serious subjective physical sensations before operation. Trotter stated that nothing was done to the brain; the bone defect merely was corrected and he believed and justly that the correction of the bone defect produced such a suggestion of cure as to cause the men to improve.

The conduct disorder mentioned by Dr. Dana lies deeply seated in our civilization and is attributable to the fact that under the industrial system the

average workingman does not like his work, and is very glad to find a way of escape from toil in which he has no objective beyond personal freedom from hunger and the propagation of his kind.

Dr. Colin K. Russel, Montreal, said that we all know that there are some sincere cases among this class of what Dr. Dana has called "conduct disorders." We are also aware of the fact that a certain percentage are, as expressed in the army, "lead swingers," and each case has to be worked out on its individual merits, and it is only with time and patience that these cases can be differentiated. It is much easier to give a patient the favor of the doubt and say he is sincere than to accuse him of "lead swinging." But there was one constructive idea in Dr. Dana's paper of which he was strongly in favor. We ought to profit by the experience we have had in the army. Perhaps physicians with the British and French Armies appreciate this particular point more than those who have served with the American forces. These physicians went along for a year or more, almost two years, without any specialized hospital to look after these psychoneurotics, and saw the results and could compare them with those obtained after special shell-shock hospitals were established. He had no doubt, if Dr. Dana's idea could be realized and these persons could receive special attention in the early stages of their disability, that there would be a great saving to all concerned.

Dr. Charles L. Dana, in closing, said he was glad that this subject had aroused so much interest. He hoped it would be taken up by the neurologic societies of the country, so that more attention would be paid to legislation regarding compensation methods, and also so that more definite views on the subject might be secured from neurologists.

In regard to Dr. Cushing's statements, he believed that he was correct to this extent that not all of these patients recover when compensation is given.

Dr. Dana thought that what we lack is a definite knowledge of the natural history of this particular group of injuries. He could not find any complete description of them. A bruise of the brain is not like an ordinary injury.

THE CONTROL OF INTRACTABLE PAIN BY SECTION OF THE ANTEROLATERAL COLUMNS OF THE CORD. Dr. Charles H. Frazier. This article appeared in the August issue, page 137.

DISCUSSION

Dr. Adolf Meyer, Baltimore, asked Dr. Frazier and Dr. Spiller whether, in these operations, they had found any evidence of the existence of a bundle claimed by Head and designated as Tractus spinothalamicus ventralis for touch—a bundle of fibers on the ventral side of the ventral horn? Its existence had always seemed doubtful to Dr. Meyer, and he thought perhaps the surgical experience of these gentlemen might have thrown some light on the subject.

Dr. William G. Spiller, Philadelphia, said that the great danger in this operation was the involvement of the pyramidal tract, because if cut, paralysis would result. It is not an operation which a surgeon should undertake, unless he has had considerable experience in the surgery of the spinal cord, because it is an exceedingly delicate one. If the pyramidal tract were damaged slightly, as was probably the case in the patient referred to by Dr. Frazier, permanent disability might not exist, but it is not an agreeable thought that one has been the cause of producing paralysis in the lower limb of a man who had no paralysis before operation.

He did not believe the fibers of pain and temperature were situated in Gowers' tract, but that they lie rather interiorly, and that often the surgeon did not cut a sufficient number of these fibers to produce the loss of sensations of pain and temperature. Dr. Spiller could see no reason why, if this division of the cord were made in the thoracic region, a surgeon should not cut nearly to the anterior horn, and even if he were to put a part of the anterior root at the level he could not see that he would produce harm. The nerve cells in the thoracic region were not so numerous as in the cervical and lumbar regions. He did not believe (though he had not had any experience to justify the statement) that the cutting of the anterior horn in the thoracic region, or even a part of an anterior root, would produce permanent disability. In fact, one could not cut an entire anterior root, because the filaments of any one root of the thoracic segment extend over a considerable area of the spinal cord. At most, one could only cut a few of these filaments, but he must be careful to avoid the pyramidal tract. The possibility of hemorrhage must also be considered.

Dr. Charles H. Frazier, in closing, said he could not answer Dr. Meyer's question as to the section of any cord tissue on the ventral side of the ventral horn. In cutting the anterolateral columns they had not extended section beyond the ventral horn.

ON THE COINCIDENCE OF CERVICAL RIBS AND SYRINGOMYELIA.

Dr. Peter Bassoe. This article appears in this issue.

DISCUSSION

Dr. S. Philip Goodhart, New York, said that Dr. Bassoe's contribution was most important. It emphasized the need of care in diagnosis in a class of cases that was becoming more frequently recognized.

The congenital anomaly, a cervical rib in the human being, he believed could be regarded as an evidence of atavism, since in the embryo of lower vertebrates each vertebra had an attached rib. In the reptilean, the embryonic elements proceed to the formation of true ribs. Cervical rib in man was known to be not so infrequently associated with diseases of the central nervous system, and there were quite a few cases on record in which it had been found in syringomyelia.

The abnormal rib was probably only a part of the anomaly of which the defect in nerve morphology was another.

Some ten or twelve years ago he had under his observation a patient with double cervical rib, that is, one on each side. The case had been referred to him as one of progressive muscular atrophy. The diagnosis had been based on the progressive wasting of the forearm musculature. His examination revealed in addition to the muscular atrophy of the lower motor neuron type, in both forearms and hands, areas of hypesthesia and hyperalgesia irregularly distributed over the left forearm. These areas varied and finally disappeared, the only permanent sensory change being an area of hypesthesia involving all forms of sensation in that part of the forearm and hand supplied by the inner cord of the brachial plexus, especially in the ulnar area. The sensory changes were found on one side only.

Fibrillary twitchings were conspicuously absent. He found two prominent osseous tumors, one just above each clavicle. The roentgen-ray examination confirmed his diagnosis of double cervical rib; a marked scoliosis was also found.

Dr. Goodhart referred the case to Dr. Alfred S. Taylor for surgical relief. Both ribs were successfully removed by Dr. Taylor and the patient was relieved of pain of which she had begun to complain, and there was no further progress of the muscular atrophy. The patient had since married twice and had almost normal use of her upper extremities. In publishing the case later, he emphasized the not uncommon association of cervical rib and syringomyelia. There was a patient with syringomyelia at the Montefiore Hospital under his care in whom pain along the inner side of the left arm was a conspicuous symptom, with marked scoliosis of the same side involving the upper dorsal and lower cervical region and great deformity; a cervical rib was demonstrated by the roentgen ray. He believed the pain in this case was due to the bony malformation with pressure on the plexus. Another peculiar anomaly in this case was underdevelopment of the ribs, all of them being very small in circumference.

The not unusual association of cervical rib with organic nervous diseases should always be borne in mind.

A PSYCHOLOGIC STUDY OF A MEDIUM. Dr. Morton Prince.

This analysis shows the birth, development and disappearance of the spirit and the origin in the medium's own subconsciousness of the knowledge given in the alleged spiritualistic communications.

DISCUSSION

Dr. William A. White, Washington, said he could add one further link to the description of the case that Dr. Prince had given. It seemed to him that there was a close connection between this compensatory mechanism and the particular incident in the past life of the medium on which she chose to base this mechanism. The old portrait that had hung in the house for many years had, as a matter of family tradition, been invested with the power of rehabilitating the family fortunes, and it was just that nucleus of wish fulfillment that hung about that whole picture which was utilized later by the patient as a mechanism for bringing about the compensatory psychosis. He thought there was an intimate connection which was quite apparent.

The presentation was exceedingly interesting and emphasized to his mind the one great and valuable communication which psychanalysis had contributed to the problem of mental disease—the fundamental conception of psychologic determinism. Dr. Prince was able to work out this psychologic fancy because he approached it with the firm conviction that psychologic facts were just as much facts as any other kind of experimental facts, and that they were not incidental chance, but that there must be adequate cause for them, and that cause might be determined as a psychologic one—that they must have some adequate goal toward which they were reaching. With a firm conviction of psychologic determinism, psychologic fact and psychologic causes, and that they existed for a purpose, these cases could all be analyzed just as clearly as Dr. Prince had analyzed this case.

Dr. Morton Prince, in closing, said that in narrating the analysis of this case of course he had left out a great many details and especially those which concerned the motive. Undoubtedly there was a strong desire to rehabilitate the family fortunes, but he thought the main motive was based on the promise made to her for the attainment of future happiness. He also thought there was a side to her character, although repudiated by the dominant side, which

possessed a love of notoriety. The main motive, however, was the desire for happiness. He should have pointed out, as it was a matter of interest, that after the analysis had been made and the real facts had been brought to light, she said—referring to spiritualism and her supposed mediumship—"I have had enough of them: I do not want to hear about anything more or investigate further the alleged spirits; I am quite satisfied." After the revelations she was for a brief time distressed beyond measure and for the moment fell back into the state of her former depression. This was due to a realization of the false position in which she had placed herself because of having deceived, although unwittingly, herself and, above all, her friends who had had such trust and confidence in her. This state of mind, however, was one Dr. Prince easily corrected.

A DIAGNOSTIC CLINIC FOR ADOLESCENTS: PURPOSE AND ORGANIZATION. Dr. Pearce Bailey.

A number of years ago, in considering what psychiatric and social diagnosis could do for education, Dr. Bailey was struck by the large number of people who early in their careers gave signs of imperfect adjustment to their environment. This was shown by military statistics which in some countries, such as Germany, showed nearly 50 per cent. of recruits to be unfit for first class military service. It was shown in this country by statistics dealing with higher education. For example, in one of our schools of technology not more than forty out of each hundred entrants receive diplomas at the end of four years. Statistics from schools that maintain a follow-up system of their graduates showed that 20 per cent. of the students who entered did not graduate from college. In all large schools for boys and girls there are constantly pupils who do not fit in, and the parents or teachers are not able to find out just why.

The misfits and failures in occupational and social relations during adolescence, although more difficult to determine statistically, are too well recognized to make it necessary to take time to dilate on them before this Association. They concern boys and girls both, but since boys are, or perhaps it is safer to say have been, up till now, more important as economic assets, their careers more in view, the failures of boys have received more attention than have those of girls. It is boys on whom money is spent, for whom outlay is made, either as commercial backing or as advanced education, and so when investments of this kind turn out badly, it is boys that we hear talked about more.

Adolescent inadequacy has been recognized for years, but it required the draft examinations to disclose how widespread it is, and even now it is doubtful that there are many prepared to believe, in spite of the proofs, that more than 30 per cent. of American adolescents are handicapped in some way and require some building up, some adjustment, some special allowances and facilities before they can hope to attain all that they might attain under favorable circumstances.

The medical profession is naturally consulted in matters of this kind, and it stands ready, as it always has, to render service, paid for inadequately or not at all, for public improvement. But of this particular problem it has yet touched only the fringe. It has gone as far as aldermen and legislators permit. In the best city schools some attempt is made to classify pupils on the basis of physical and mental status, and here and there psychiatric clinics have sprung up, designed chiefly for the benefit of those actually ill, or of those

whose inadequacy has manifested itself in clashes with law and order. Most of the work so far done concerns mental defectives, the insane, neurotics and delinquents. As far as I know, there exists nowhere a personality clinic—a clinic for the estimation of a handicapped person's weak and strong points, based on complete psychologic and physical investigation, with the purpose of pointing out the most favorable adjustment for him.

The organization of such a clinic encounters great practical difficulties on the score of expense. To examine a person so as to really know him, requires a great deal of time, a number of highly experienced examiners, to say nothing of the outlay involved in laboratory work, roentgen ray, etc. With the present lack of appreciation of the importance of such work, it is imposible to rely on public money to finance it; neither will the great philanthropic foundations, as at present administered, stand behind such an undertaking. As things are at present a thorough diagnostic clinic for adolescents, or classification clinic as it may more appropriately be called, would have to be organized on the basis of largely or entirely supporting itself. It would do this by charging fees large enough to meet the running expenses.

Such a plan of organization carries with it certain practical advantages. In the first place, it furnishes at once a means of selection of candidates who are to be examined. A clinic whose avowed purpose was to prevent or compensate for failures, and which offered free services, would be at once over-run with applications, and would have no means of selecting among them. On a pay basis applications would come only from those parents or guardians who were contemplating investment, educationally, commercially or otherwise on the adolescent, and who really desired expert advice before doing so. This would mean that such a clinic would deal with a provident class, which would in itself have an important bearing on the value of its final statistics. The examinations should constitute a complete record of the candidate as an individual at the time the examinations were made. This record should show the results of heredity, of early surroundings and education, together with the demonstration of mental or physical limitations, as well as the existence of special talents or aptitudes. It would be a personality summary at a certain period of the individual's career, which would only acquire scientific value of importance if checked up, later on, by information as to what happened in following years to an adolescent who at a certain period of his development had a certain static record. It is probable that a clinic which dealt with a provident class could carry on a successful follow-up system through long periods, which is impossible with the types of adolescents that frequent free clinics. It seems that such a follow-up system could not fail to furnish facts, now almost totally wanting, invaluable to the understanding of the evolution of character. It would make available knowledge, not only as to the prospects of an adolescent with a certain personality status, but also the conditions that would have to be fulfilled in order that he might find the best adjustment.

The Neurological Institute of New York has long maintained as a part of its outpatient department, a clinic in which difficult and exceptional children have been studied. The cases have been largely drawn from the public schools. It proposes, on Oct. 1, 1920, to supplement this activity by the establishment of a pay clinic which would receive adolescents not necessarily "pathologic," and in which the examinations will be more thorough and more extensive than is possible in a free clinic. They will be made irrespective of any symptoms complained of, and will attempt to establish variations from the usual as well as pathologic symptoms. The work will be conducted by the regular staff of

the institute supplemented by such additional assistance as may prove necessary. When the examinations are completed an opinion and recommendations will be furnished to the physician or whoever referred the case. The clinic will not undertake treatment of any kind.

DISCUSSION

Miss Elizabeth Farrell, New York, by invitation, said it was a particular pleasure for a teacher or school administrator to hear from a neurologist the words that Dr. Bailey had spoken. In New York they would welcome the organization of any clinic in a way that Dr. Bailey himself did not appreciate.

Her own work began with backward children and defectives, but she would dismiss that whole subject with the statement that they had more than 4,000 of these children in their classes today.

The problem which was uppermost in their minds was that of children not mentally defective, per se, but of children who presented problems of behavior which finally worked out into real social problems, after school life, in the community and in the world. If she could add anything to Dr. Bailey's suggestion it would be that this clinic get the child early in order that they might get what Dr. White told them always to get, namely, those early manifestations of maladjustment which, if not corrected, finally evolve into serious maladjustments of one kind or another.

These children may be divided into two groups—those who are highly gifted and superior children, and those children who are not so gifted. The first group represents the most serious problem in school administration that must be dealt with now—what is to be done with them and how is it to be done? The gifted children are the most neglected of all the children in the schools today. That is true of the schools in Pittsburgh, and it is true as well of all schools all over the country. She thought the fault was that society demanded of schools a certain uniformity of teaching and of subject matter that was deadening, and that it was the maker of mischief and of problems in children who were different from other children. She stated that these gifted children were not worked to their full capacity, and developed very real behavior problems. They develop a superficial attitude toward the teacher, toward the work and toward the school. They know they can do the work the school requires of them without any effort; the community is not intelligent enough to have them make the effort; and instead of getting intelligent understanding and intelligent development of these gifted children, a superficial development that makes for all sorts of deviltry and lack of achievement in later life results.

In addition to the problem of the gifted children, there is the problem of those children with special ability, and this she repeated was an indictment of all communities. They are asked to teach all children to read, write and cipher, and when wood, paints and sewing material were asked for the request was not readily granted because they were regarded as fads and frills. Her statement was an indictment of all schools. She had in mind a little boy brought up as a serious offender. He would not go to school and would do many other things. He did more harm than they thought it possible for any boy 12 years old to do, and they wondered how he could possibly have the resourcefulness to carry through some of the activities in which he had indulged. He carried them through, but was caught at last. The examination, the search, as Dr. Prince would call it, for the motives that were driving this boy on to a career chosen for himself revealed the fact that this boy, a dweller of the

tenements, from a poor home, had hidden away in his personality such a gift with pencil and paper, with pen and brush, as was not found in one among thousands. The boy was not even one of the gifted children. They had of course to decide what should be done with the boy who was a great mischief maker. The ordinary procedure would have been to send him to the Truant School, where he would receive no thorough instruction along the lines of his bent. But, instead of that, he was given a chance to get training in this wonderful ability. In eight months he had developed from the undesirable character into a boy with self-respect, ability and skill, and he was interested in his career, which was a promising one.

These special ability children need to be recognized in the schools. They need to be provided for in the schools and not handled like machines, and this was a subject for consideration.

She wanted to add a word to what Dr. Bailey had said in regard to endocrinology. The number of endocrine cases that they had was perfectly astounding, and it was equally astounding to see what treatment would do for them.

Miss Farrell wanted to leave a message with the association, and that was to demand that education in communities be made to meet the capacities, the interests and the special abilities of the children.

Dr. Stewart Paton, Princeton, said he did not believe it was necessary in this Society to spend time in urging the importance of such an institution. An institution of this character not only would be of great benefit to those who went to the institution for advice, but it would also be of service to teachers who might be brought there to ask for advice about pupils. This would give the teachers a biologic conception of education. It was not necessary, however, to wait until there was such a complete organization as Dr. Bailey suggested. It was quite possible to begin now in our universities by supplementing the excellent work done by the present department of hygiene. Students should be taught the essentials of mental hygiene as part of their education.

It was amusing to reflect on the fact that while violent discussion had recently taken place in academic circles as to whether the Greek grammar should be retained in the curriculum no one seemed to think it worth while to suggest that the Greek spirit be introduced into the universities. The advice given by Socrates was that the essential part of an education was to "know thyself." It seemed to him astonishing that this point of view had received so little consideration. Dr. Paton would have liked to have shown some records of students which he had in his possession. If the heading were taken off these records, one would be unable to say whether they were students in universities, supposed to have acquired the academic essentials of education, or whether they were patients in the Phipps Clinic in Baltimore, or in Dr. Tilney's Clinic in New York. The great majority of students had not the faintest knowledge of their own adjusting capacity and limitations. As a matter of fact, there were only two or three universities in the country in which any effort ever had been made to teach mental hygiene and give students the essentials of an education. So-called educational institutions were graduating a great many maladjusted persons.

Dr. Adolf Meyer, Baltimore, said the important point in this question was the manner in which to attack the issue. Was an institution of a formal character the most desirable starting point? Would it not, perhaps, be well to keep the organization more or less in the background, and carry on the obser-

vation of the individual under the most natural conditions, instead of bringing him into a totally strange situation—that of being examined in a special institute? In this connection he emphasized what had been the upshot of some work undertaken in one of the schools of Baltimore, a school which was first made the center of investigation for the usual study of feeblemindedness, and in which spontaneously and really of necessity attention was extended to the study of the nonfeebleminded, to those who gave problems because they were too much for the teacher rather than too little. In this interesting work, carried on somewhat along the line which he described in a lecture published by Macmillan, together with lectures of Jennings, Watson and Thomas, in a book entitled "Suggestions of Modern Science Concerning Education," Dr. Richards studied the pupils about whom difficulties were reported by the teacher or by the parents or usually by both, often without any realization of the individual, though the issue was more than obtaining a greater familiarity with the pupil's problems and with his home. The point especially to be raised was that not only in the high school or university, but even in the upper grammar school stage, the important facts always referred back to the reports of the first year—the first contact the child ever had with the school. In Dr. Richards' studies it was found that there was a problem in a large proportion of those individuals from their earliest years, and therefore he urged that these investigations should be carried out in the initial stages. It should be one of the problems of the schools of today to standardize the pupils, not in the way of labeling or marking them, but in making them know what they were best fitted for. That should begin in the earliest grades and ought to be carried on from there.

As to the organization proper of the work he referred to, there had not been any special financing. The money had to come partly out of their own pockets in the beginning.

For the fundamentals, it was quite essential that one should work in the natural environment in which things happen.

Dr. Bernard Sachs, New York, stated that every one felt the need of an organization such as Dr. Bailey had so ably described, and which Miss Farrell had endorsed. He wished to present one rather practical aspect of the situation. If the community at large were to be benefited he would not advise the organization of a diagnostic clinic for the purpose of determining the mental condition or aptitudes of children. That mere fact would prevent thousands of people from coming for assistance because the implication was that by reason of that application the child was already labeled as somewhat defective. For that reason he thought it should not be called a diagnostic clinic and advised, for the present, the name of a diagnostic class. Neither did he believe it should be linked up with a hospital or institution, but with the educational system, and especially if it could have the assistance of such able women as Miss Farrell, who, in New York, had done so much in the educational system provided for defectives.

Of course, in an educational class of this kind, or in a diagnostic class of an educational system, the active support of neurologists, psychiatrists, and possibly some psychologists was necessary.

So far as the necessary financial support was concerned, he had not the slightest doubt that if the public at large were shown the benefit that would accrue to the entire community by such an organization, there would be no difficulty in getting such support. In New York City the need was great.

DR. E. W. TAYLOR, Boston, said that apropos of what Dr. Sachs had just said, he would like to mention that for some years past special classes had been connected with the public school system of Boston. These classes were made up of exceptional pupils, not necessarily feebleminded, although naturally the mentally backward pupils constituted their most important element. These special classes, so far as he knew, had proved a decided success and had helped to solve the problem of the exceptional child.

Dr. Taylor gave a case history which fell into the category of that cited by Miss Farrell. It was that of a young boy, 10 or 12 years old, who came to the hospital as an incorrigible some years ago. He could no longer get on in the school, and was sent to the hospital in order that inquiry could be made into his mental state. On being questioned, he stated that what he would most like to do was to go out early in the morning, sit in a meadow and see the sun rise. On questioning him further, it was found he liked to draw, and he then made a sketch on the blackboard which was so excellent that it was preserved for several years—a train of cars coming around a curve in perspective. He was then talked to further about what he was studying in school, and it was explained to him how desirable it was, if he wanted to go to the Art School afterward, that he should study geometry and kindred subjects. He took these suggestions and became almost immediately a model pupil and did exceedingly well from that time on. Dr. Taylor had not the slightest doubt that he would be a useful citizen instead of the outcast which he was on the point of becoming when sent to the hospital for study and observation.

DR. WILLIAM HEALY, Boston, stated that it was most interesting to hear a group of neurologists entering into this particular discussion. Dr. Sachs made a very good point. In developing their work in Boston, after years in Chicago, they desired to leave out the word psychopathic in order that any stigma that might be connoted by reason of this name should be avoided. There was no necessity whatever for allowing this implication to be a feature in the situation, and if it is not, one finds no trouble whatever in getting the cooperation of people in general. It was important for any one doing this type of work to see plenty of normal individuals for the sake of developing norms of a check group. They had seen cases of many school children and others who were not specifically regarded as psychopathic problems.

Just this minute it had been suggested to him by someone present that after all the discussion that had been going on showed that neurologists were not well posted on what was being done in various centers. A great deal of what had just been advocated was already being accomplished, from California to New England. In a number of communities by a variety of organizations children were being studied for problems concerning their mental make-up.

DR. MORTON PRINCE, Boston, said that Dr. Healy had just brought out the point he had been thinking about while the discussion had been going on, and that was whether or not, as neurologists, they were really fully equipped for attacking this big problem. He concurred with Dr. Bailey's idea, and thought there was a great deal, too, in what Dr. Sachs had said.

It had been forced on him in recent years that there were in the universities (and he had Harvard particularly in mind) a goodly number of students who were maladapted to their situation—to the demands made on them by their social and educational environment—who were unable not only to pursue

satisfactorily their college courses and to fulfill their aspirations, but also to solve the everyday problems of their lives. They seemed to be misfits and a puzzle to their teachers who had undertaken to advise and guide them. He had been consulted a number of times by the teaching staff in regard to such students, but had felt inadequate to advise, partly because of the difficulty of the problems and partly because of the enormous amount of time it took to adapt such students to their situations. To do this required one who had the knowledge and could give the time to an intensive study in each individual case. Such cases involved problems of personality and he doubted very much his ability and the ability of neurologists as a class to solve such problems. They would have to know more about the personality and the conflicts that go on below and within, that is, what brought about the maladaptation, before it could be understood why these individuals were unable to adapt themselves to the conditions of their lives—to reality.

Dr. Prince thought, therefore, that it was possible that such an organization as Dr. Bailey had proposed might be begun within the colleges. It was there it was needed. And from such an organization within the colleges it might be extended to comprehend other classes of the community. He was quite sure that one of the most fruitful results of such an organization would be the education of neurologists, as well as the reeducation of these maladapted individuals. Neurologists need to be educated before they can undertake the reeducation of others.

Dr. Pearce Bailey in closing said that this idea first came to him a number of years ago in his work with Dr. Allan McLane Hamilton. He had long had the idea that the aptitudes of normal people might be determined experimentally, and that useful advice, based on the study of the normal individual, could be given as to a future career. He differed somewhat with Dr. Hamilton on that point, and his subsequent thought in the matter had referred more to the slightly subnormal.

It was easy to see that a clinic of this kind would attract, more or less, people decidedly subnormal, delinquents and mentally defective individuals. But that was not the original idea and that would not be the class that they would wish to have come to them. The idea would be to make this clinic an organization for those boys and girls who had no conspicuous defects, and yet who did not seem to be quite in harmony with their environment.

Dr. Bailey was fully cognizant with what was being done by Dr. Healy of Boston and Dr. Goddard of Ohio, but he did not take up that side of the question; for as originally conceived, this clinic was social and economic rather than psychiatric. For example, 20 per cent. of the boys who go to college have to leave. These boys are not defectives or delinquents. It was an important economic situation with their fathers. What influenced their leaving? Then there were other boys who could finish their college course who would have been much better off if their fathers had determined that they were not exactly fitted for that kind of life.

As far as the organization was concerned and Dr. Sach's remarks that it should not be connected with a hospital, of course it was necessary that a clinic of this kind should have practical support, and if this practical phase was borne in mind it made it simpler to start such a work in a hospital for the reason that the staff could be utilized so largely, because they were there and readily available. It would be an expensive procedure if organized in any other way.

NERVOUS SIGNS AND SYMPTOMS AS RELATED TO CERTAIN CAUSATIONS OF CONDUCT DISORDER. DR. WILLIAM HEALY. This article will appear in an early number.

DISCUSSION

DR. MORTON PRINCE, Boston, thought that the interesting paper of Dr. Healy was suggestive. He could confirm the phenomenon reported, of somatic disturbances, such as headache, pain, dizziness and nervousness, occurring at a moment previous to or during the eruption into the mind of some impulse or of some repressed idea that had been put out of the mind. It was a phenomenon which he had observed over and over again and which was quite common in certain types of cases. He had never had any experience in the kind of case — the delinquent — reported, but it was interesting to correlate the phenomenon in these cases with the same phenomenon as observed in other conditions. He would perhaps take a little different point of view in regard to the mechanism of its occurrence, to the relation of the physical phenomenon to the accompanying impulse to action or to the emergence of the idea. Investigation, in his experience, had always shown the somatic phenomenon to be due to, and the resultant of, a mental conflict—a conflict with a subconscious process. When such conflicts occurred there was apt to be a somatic symptom, such as headache, dizziness, etc. The latter stood in a resultant, not a causal relation to the conflict, that is, to an idea with its impulse striving to obtain expression.

In the very case he reported he had seen on a number of occasions the production of these somatic symptoms when a subconscious motive, or impulse or mental system was endeavoring to come to the surface and obtain expression. On one occasion, for instance, the patient complained of intense headache. This was easily traced, as he anticipated it would be, to a mental conflict—to ideas which had been repressed and which were attempting to determine the conduct of the personality—to erupt into consciousness. In the course of the interview, as soon as the conflict was relieved, the headache immediately ceased. On another occasion there was intense headache, nausea and dizziness. These immediately ceased on the solution of the conflict when the subject was hypnotized. She then recognized herself that these somatic symptoms were only the result of the conflict and were not due to any physical illness, as she had thought was the case during the time of their occurrence. In another patient he had seen again and again what were apparently sick headaches, for which her attending physicians had given morphin and every sort of medicine without relief. In that case it was easy to trace the headache to mental conflicts which were correspondingly easily and immediately dissipated by relieving the mental condition.

While in such instances these somatic symptoms may be interpreted as an attempt at a defense reaction, yet from another point of view, and especially in certain cases, he thought they might be interpreted as being due to the discharge of emotion along sensory pathways.

After all, this phenomenon, it seemed to him, was observed in normal individuals in the course of everyday life. Given a person with a certain kind of temperament and let that person be torn between two desires or impulses, which meant a conflict which he could not for the moment satisfactorily solve for himself, and he would complain of headache, nervousness, dizziness, etc., resulting from the struggle and antagonism between the two

impulses. This was the common, everyday phenomenon which we had all observed and which perhaps some of us had experienced. The principle, it seemed to him, was the same as in abnormal cases.

It must not be inferred from anything that he had said that every time one sees a person with a headache, or other nervous manifestations to which reference had been made, that it is necessary to seek for a conflict of some kind, or that there is an attempt of some subconscious impulse, or idea to erupt into consciousness. The same kind of somatic symptoms occurred, of course, under all sorts of conditions.

Dr. Smith Ely Jelliffe, New York, said that the clinical material which Dr. Healy had presented seemed to him to afford an extremely interesting and suggestive clue to the beginning of a type of processes, to which Dr. Prince had just referred, some of which had interested him for a great many years.

He reminded the Association of a photograph in the "Scarlet Letter," in which Hawthorne says, "that a bodily disease which we think of as a thing apart and separate in itself, may be after all only a symptom of some disturbance in the spiritual part of our nature." Hawthorne had the right idea, and Dr. Jelliffe was convinced that Dr. Healy had given an excellent picture of the beginning of this split, whereby the body was made to become the scapegoat of the spirit. It must be assumed in the process of evolution that ethical imperatives biologically implanted for thousands, perhaps millions of years, caused a striving toward better social adjustment of the individual. These young juvenile offenders showed in the minor physical or somatic symptoms, the results of the conflict between their inherited biologic ethical imperatives and the conditioned reflexes of individual self satisfaction. They compromised, partially carried out the behavior of pleasurable gratification, but not with complete somatic success. The body symptoms showed that the ethical imperative, or what the religious dialectic would term, conscience, had a hand in the compromise reaction, and thus to recur to Hawthorne's line, the bodily discomfort was the symptom of the spiritual maladjustment.

To Dr. Jelliffe the important suggestion was that whereas Dr. Healy had pointed out some of these minor manifestations of a conflict with a satisfaction of the opposing trends, or a partial satisfaction of the opposing trends —with some stealing and some somatic disturbances—as these patients were followed later in life, say fifteen, twenty, thirty, thirty-five to forty-five years, the same types of compromise going on, with different intensities, and with different types of conventional ethical milieu, they finally arrive at a group of things which we call "organic diseases," or which by specific complications as from certain infections, become special types of organic disease. And, as that was the general theme of the subject he hoped to pursue in his paper he simply emphasized the scapegoat nature of the body that wears a hair shirt, as it were, in the form of physical disease, in order that the individual might conform, in part at least, to the rulings of the herd; as it was more important for the individual to stay in the herd than for him to suffer physical disease, he tears his body down, unconsciously, in order that he may not be excluded from the herd.

Dr. Abraham Myerson, Boston, said there were a few points he would like to discuss: First, the type of conflict that Dr. Healy had brought out occurred commonly in the housewife. Many symptoms of the nervous housewife, such as headache, dizziness and vomiting, were frequently related to disloyal thoughts.

It did not seem to him that to explain this required a complicated analysis. It was not necessary to go quite so far as to say that the body was the scapegoat of the mind in order to account for the headache, dizziness and uncomfortable feelings. Any conflict of ideas had with it a group of associative somatic changes in the blood pressure, associated changes in the heart action and in the lungs and everywhere throughout the body. There were two groups of ideas and the oscillations in conflict, alternating in consciousness, between them causes such changes in the adaptive mechanism of the individual that he cannot translate them into action. The ideas themselves may be called the cerebral reverberation of events, and the associated emotion may be called bodily reverberation of events. This group of conflicting ideas cause or are associated with bodily changes that make it difficult for the individual to discharge his energy into action.

As to therapeutics, he thought that in the treatment of cases of mal adaptation to society, we forget that which we constantly keep in mind in the treatment of somatic diseases. In the latter we keep in mind that there is a natural tendency to get well. We keep in mind constantly that there are processes whereby the equilibrium is regained. It was not thought that typhoid fever was cured if calomel were prescribed and the patient recovered. More cures occurred by coincidence than through actual treatment. In the majority of cases of social maladaptation there was a natural tendency to recover, a belated adaptation that arose spontaneously. It is necessary to be as critical of our efforts in this field of therapeutics as in any other field.

Dr. Stewart Paton, Princeton, N. J., said that two cases of stealing which occurred among university students had come under his observation. There were a great many interesting points in the history of these students, but the one he wished to emphasize was that any one knowing these facts and understanding the methods of analyzing a personality would never have allowed the students to have entered a university. In one of the cases, it was easy to trace the signs of instability back to the student's earliest years.

There was a great field in our universities for any one interested in the study of the human personality. He believed it was quite possible for the Association to do a great deal of good, and he agreed with Dr. Meyer that the sooner an organization was perfected for making these examinations in the school period, the better; and the more chance there will be of introducing the biologic conception of education into academic circles.

Dr. Herman M. Adler, Chicago, asked Dr. Healy this question—What was the relation of the intelligence of Dr. Healy's patients to their behavior reactions? Because of the examinations of the soldiers in the recent war and because of our cases, it looks as though there is some relationship between the intelligence rating and these psychoneurotic manifestations. In general, our patients have shown the correlation of a high intelligence quotient with a relatively complex reaction. Where the intelligence quotient is low, the reaction is simple.

Dr. William Healy in closing said he had only to say in closing that this topic was really worthy of close attention by neurologists. Not only were many cases not being seen which should properly be studied, but cases were also frequently seen that had been passed over by neurologists who had not arrived at essential facts.

He was not altogether clear about the explanation of the results Dr. Myerson discussed. Dr. Meyerson had suggested that there might be an element of suggestion in the outcome. About that he thought one could

not express oneself with surety. It may be partly this and partly due to the intrinsic value of exploration itself. For the first time somebody presented himself who was willing to listen with the right kind of interest and to make the right kind of inquiry. Where the repression and behavior reaction had taken place over years, it seemed clear that the individual had been almost waiting for this situation to present itself, waiting for an understanding listener. There was a great deal that could be said about this question of the actual cause of the wonderfully good therapeutic results that were so frequently observed, and a long discussion could be centered on this special points. The fact that these misbehaving and suffering individuals had never revealed their real inner life previously was a striking lesson for parents so rarely do anything to understand their children deeply.

The continual finding of these intricate behavior reactions only in individuals of relatively high intelligence led us to have the same opinion that Dr. Adler expressed. There seemed to be few exceptions to the principle that where the intelligence was low, the reaction in behavior could be explained in simple terms.

THE PSYCHONEUROTIC ELEMENTS IN JUVENILE DELINQUENCY.

Dr. Herman M. Adler.

Dr. Adler presented cases from the Juvenile Psychopathic Institute, Chicago, illustrating the psychoneurotic type of reaction to socially difficult situations—the conflict betweeen fear and desires. He made a comparison with forms of shell shock. He advocated therapy by suggestion and social after-care. He compared these cases with cases of adult criminals. He concluded with comments in regard to the more general application of psychiatric methods to the treatment of delinquents and criminals.

DISCUSSION

Dr. Harold N. Moyer, Chicago, said that the last case reported by Dr. Adler was one of the most bizarre that had ever come under his observation. The confession of the man was for the most part incorrect. His memory of the crime was fragmentary and confused. The case illustrated the great difficulty in sifting evidence.

Dr. Herman M. Adler, in closing, said that he read the account that the man had given. He heard from Dr. Moyer that there were some details of this sort that he was going to present, and that was the reason he selected this case. As a matter of fact, it did not make any difference. It altered a number of points, but it did not alter the essential fact that the man was amnesic and did not know what he was doing.

As a member of the state board he would like to tell Dr. Moyer that when he had all this information eventually in hand, if he would present it before the board, Dr. Moyer was sure that something would be done to commute the sentence of the man.

THE DEMENTIA PRAECOX PROBLEM. Dr. Henry A. Cotton.

Dr. Cotton presented the difficulties of diagnosis. He discussed the question whether or not dementia praecox is a disease entity; the etiology of chronic infection, and the reasons for considering dementia praecox an organic disease.

DISCUSSION

Dr. John W. Draper, New York (by invitation), said he appreciated the privilege of speaking before the Association. He knew nothing about mental conditions, but he was in a position, he believed, to say something about the surgical pathology in these cases. He and his colleague, Dr. Lynch, had operated on about 130 patients for Dr. Cotton. All the operations were abdominal, and they had the satisfaction of not opening a single abdomen without finding pathologic conditions.

It is well known that a great deal of surgery has been done on the insane —a great deal of good surgery—but it has been directed more toward the relief of pressure due to tumors and various disabilities of that type, particularly in a gynecologic way. Their work, however, had been directed chiefly toward the lesions to be found in the alimentary canal.

Dr. Draper said that the pathology present consisted in an abnormal position due to faulty development of the right side of the colon. This side of the colon is developed last; it frequently does not develop until the first year of extra-uterine life, and in many cases there is lack of fusion, and that is productive of so-called congenital bands. The result is that pathologic changes in that segment of the bowel occur later in life. He did not mean to say that this was the only segment of the bowel that had been involved in the cases which Dr. Cotton had presented for study, because in a great many there was also involvement of the oral portion of the small intestine. However, there is no doubt that the right side of the large bowel is the decadent portion of the alimentary canal, probably owing to its late acquisition. At all events, whatever the cause, the pathology is there.

Of course, they had examined the specimens that had been removed, that is, anywhere from 18 inches to 2 or 3 feet of the segment involving the terminal ileum, cecum, ascending and transverse colons. The terminal ileum arose from the hind intestine and participated with the cecum in this tendency to infection. Dr. Ewing and other pathologists, had reported that these specimens contained as much tissue change as they had ever seen. Everything was involved. In many of them there was an immense increase in the fibrous tissue, a general fibrosis, in which the blood vessels, of course, shared. Most particular and important of all, there was an invariable involvement of the mesenteric glands. They had removed many hundreds of these glands at operation, and if cultivated, they always yielded living organisms—streptococcus and colon bacilli of varying types being the most constant.

Dr. Ernest Sachs, St. Louis, stated that as a one time general surgeon and as a teacher of surgical pathology for the last ten years, he would like to register a remonstrance against the surgical work in the right iliac fossa in these cases. The best monograph he knew of on studies of the appendix, which was recognized all over the world, was that by Professor Aschoff of Freiburg, who showed that there is no appendix in any one above the age of 3 or 4 which did not show the pathologic changes that Dr. Draper had just described. In other words, one never sees in an adult a normal appendix—one in which these changes do not occur in the musculature, fragmentation, infiltration of leukocytes occasionally, and, of course, abnormal position. This gastro-enterologists doing a great deal of roentgen-ray work had recognized for a long time.

Dr. Sachs said we had just recovered from the epidemic of removal of the colon for epilepsy which started in Cincinnati. He had the privilege of

seeing some of these cases before and after operation. It may not be known to all that in a public meeting in Cincinnati Dr. Reed was obliged to retract all that he had claimed for this operation on epileptics.

Dr. Sachs felt strongly that there was nothing that was going to bring surgery into disrepute as much as this type of surgical work, because he thought it had been shown beyond all question that the various configurations of the large intestine and those of the other intestinal organs vary enormously in different types, and most surgeons feel quite certain that they can place little faith in the work first popularized by Lane of London.

Dr. Charles K. Mills, Philadelphia, said that he had elsewhere presented his views with regard to certain phases of this subject. He had no doubt that the remarks of Dr. Sachs were entirely correct and applicable. The essential thing was that we should not be misled with regard to the etiology of well-known mental diseases by these reports on the discovery and removal of infections, whether in the teeth, the tonsils, the intestines or wherever the location may be. It was undoubtedly true that the idea had gone out that dementia praecox, manic depressive insanity and ordinary paranoia were due to infection and could be cured by the removal of the infection. He did not believe that there was any truth in this statement. It would be difficult in a few words to say what these affections were. Perhaps the word teratologic or embryonal expressed the idea of their nature in a general way.

Unquestionably, insane patients often had bad teeth, but so had multitudes of others who were not insane. But, as he read the title of this paper, it was "The Dementia Praecox Problem." The problem of dementia praecox, as presented here today, would seem to indicate that the essential cause of this disease was infection, which as he had said he did not believe was true. Many good teeth had been removed because through the newspapers, as well as through other publications, the idea had reached the public mind that a common cause of mental trouble was to be found in diseased teeth.

Dr. Adolf Meyer, Baltimore, said that this was a difficult problem to discuss unless we dissolved it into the component factors. Unless we got to the point where we are perfectly willing to discuss honestly and sincerely the independent factors before we speculate about "the pathology" found in the intestinal tract and the diagnosis of dementia praecox, we cannot regard ourselves as intellectually safe. He admitted a certain suspicion when he heard any one speak of "finding a great deal of pathology" in the intestinal tract. Disorders or lesions may be found, and yet we may have a hard time to determine what "pathology" would explain these facts.

It seemed absolutely essential to recognize that a multicellular individual, such as man, an individual with so many organs, an individual with so many functions, and an individual with so many problems to meet, could not be dealt with under just one category, by giving an array of pictures of teeth and speaking about the mental problems as if they were merely incidental. It was wrong to discuss mental pictures leaving organic difficulties out of the question. It seemed to him that if we wish to attack this problem on its proper basis it was essential that we cultivate a certain type of intellectual morality, accepting the fact that the individual was a complex mechanism made up of many factors; that we did well to deal with the different factors independently until we knew exactly what they were; and that then we might begin to show what their correlation may be. From this point of view, Dr. Meyer had relatively little patience with those who scoff at a more careful study of the gastro-intestinal tract and of the infections, whatever they might

be. A careful study should be made of them. It was not an adequate excuse for not taking up a thorough investigation of disorders of the intestinal tract simply to say: "Nearly everybody has them." The fact that many people were able to drink alcohol with impunity, did not change the fact that with some persons its use was disastrous. It was natural, of course, that we should use our judgment with regard to the extent to which we should go into special factors. We realized that we could not all do everything and we therefore focused on the things we could do best, and on that which was likely to mean most for the patient.

For the sake of research, his suggestion would be that some of the foundations that lavishly support many other directions of investigation, might perhaps be induced to put aside some funds for an unquestionably unbiased corps of workers who would take up the various essential aspects of this problem and carry the work through as thoroughly as it could be done. To do that would take a great deal of work, and above all people of great experience. It certainly could not be done out of nothing or with the merely partial organizations of today. If there was any possibility of inducing some of our foundations to take a positive interest in this we should have a much more instructive and profitable time than with a discussion of the question, which gives us only one or two aspects of the problems in each patient.

Dr. William A. Jones, Minneapolis, said that it seemed to him that all this discussion was like "a tempest in a thermos bottle." Dr. Cotton, in presenting his subject, based his studies and his conclusions on a sufficient number of cases from which to draw a lesson. The pith of his paper was that each patient should be given a complete and thorough examination and, also, any pathologic condition that might influence the future life of the individual should be removed. Whatever the conclusions were, Dr. Cotton's methods of investigation were good and sound.

Dr. Henry A. Cotton, in closing, said that of course one could not give all of one's data in the time allowed for reading a paper, and in the remaining few minutes he wanted to give some of the results. He thought that it would be admitted that twenty years in this work had given him a little experience. When he said that for eighteen years he did not do anything for his patients, he meant that if they recovered they did, and if not, they did not. He thought that had been the experience of every one interested in the disease. For the last two years he had been doing something, and his patients had been recovering. He had given the facts and said that Dr. Mills could question the truth of them, but he could demonstrate that they were able to clear up cases not cleared up before.

As to propaganda, that was a criticism which he had had to meet and which was not his fault. The State Board of Charities published a report without consulting him, which was against his wishes. It had injured him, perhaps, he did not know. On the other hand, he thought it was a favorable sign when people began to discuss the question of teeth. When a patient applied at the Mayo Clinic, one of the first things that is done is to look at the teeth. The dentists have the point of view that every tooth should be saved, but he had seen enough of these cases from personal experience to know that is a wrong idea. When people wake up to the fact that a tooth can be examined with the roentgen ray and attended to, the situation will be much better.

He believed thoroughly what Dr. Meyer said. The work must be carried out in spite of remonstrance. The work is accurate, and the fact that the

patients recover is sufficient to admit its great usefulness. Their statistics and their work are open for inspection, and any one who has visited the hospital and seen the work has not questioned the value of what they are trying to do. They expect to continue this work and hope to have better reports next time.

GRADUATE NEUROPSYCHIATRIC INSTRUCTION. DR. THEODORE WEISENBURG.

All medical centers are concerned with graduate medical education, and efforts are being made in this direction in neuropsychiatry. While each medical center should make every effort to give a first-rate course, nevertheless, all such teaching in this country should be coordinated on a broad, general plan. The Graduate Medical School of the University of Pennsylvania has established courses in neuropsychiatry lasting four months and one and two years, leading to the degrees of Master of Medical Science and Doctor of Medical Science. In the two year course the student may take part of his training in other cities. Experience has shown that courses of less than four months are not of value and should be abandoned by medical schools.

DISCUSSION

DR. E. W. TAYLOR, Boston, said that Philadelphia had been a pioneer in inaugurating graduate neurologic courses. Their importance was evident, as Dr. Weisenburg had pointed out. He spoke, however, somewhat slightingly of short courses of a month on this subject and stated, with reason, that it was impossible to "teach neurology" and "make neurologists" in so short a period of time. With this attitude one might entirely agree but this does not invalidate courses of brief duration which naturally are not designed to instruct students fully in any one branch of knowledge but rather to interest them and start them in the right direction. This was all one could attempt to do whether the courses were of one month or from one to two years. Whether a degree is conferred was a matter of secondary consequence. The essential matter is to excite more general interest in the medical profession in this branch of work. He entirely agreed with Dr. Weisenburg that cooperation is advisable and that these graduate courses should be developed in the various medical centers. In the Harvard Graduate School they hoped to establish one and two year courses somewhat similar to that suggested by Dr. Weisenburg, such courses possibly leading to some definite certificate or diploma. Some such plan certainly should be worked out, particularly in the field of neurology and psychiatry, in the attempt to establish more clearly their intimate relationship with other departments of medicine.

DR. CARL D. CAMP, Ann Arbor, Mich., said the Medical School of the University of Michigan did not have a postgraduate medical department but had developed a method of giving postgraduate instruction to certain students who desired to become especially proficient in one particular line of medical work, which should be worth mentioning.

Each year there was selected from the graduating class of the medical school one student by each chief of a clinic (in internal medicine and general surgery, more than one). This man became an intern in the University Hospital for the following year on a rotation service which included various specialties as well as medicine and general surgery. The next year he became a "senior intern" in the clinic of the chief who selected him. During the

second year he lived in the hospital and received his room and board, laundry, etc., and a small honorarium. The third year he continued in the same service and received the title of demonstrator. He lived outside of the hospital but received a salary sufficient for maintenance. The fourth year he received the title of instructor and a somewhat larger salary than the previous year. It was recognized that during his third and fourth year, although essentially a student, his services in the hospital in caring for patients, etc., deserved remuneration.

Of course the matter and the kind of instruction differed in the various clinics. It was Dr. Camp's aim in the clinic of neurology to have the senior intern interest himself chiefly in the clinical laboratory investigations, both with reference to routine examinations and research methods. He also carried out certain lines of treatment, such as giving injections, and was urged to develop original methods if possible. The student in his third year was expected to interest himself chiefly in the cases with organic lesions and his research was chiefly in problems of physiology and pathology of the nervous system. In the fourth year the cases with abnormal psychology and social maladjustment were given to him.

Dr. Camp said that each of these men did a certain amount of teaching of undergraduates, chiefly in the details of laboratory investigation and therapeutic measures, and they had the same access to the library of the university as the members of the faculty of the medical school. They had plenty of time for reading and for writing up research problems.

This method solved certain problems, particularly with reference to the development of specialists, which were sources of difficulty in postgraduate schools. The instruction was limited to a selected group of men who showed, while undergraduates, a certain mental adaptability to the special work that they wished to take up. They were guaranteed an intern year in a general hospital where modern methods are used in all branches of medicine. The time was sufficient to enable a good man to become qualified, and still it did not delay unreasonably his entrance to a productive career, and it was equally available to those who had money and those who had none.

Dr. Theodore H. Weisenburg, Philadelphia, said that he had nothing to add except in elaboration of what Dr. Taylor had said in explanation of his reference to a "brush up course." They had been giving similar courses in Philadelphia up to this year, but their experience had been such that they had decided not to continue them, because the students could not gain very much knowledge in a month's time.

The advisability of giving degrees, of course, was a debatable question. The university intended to give degrees to men who passed examinations and were acceptable.

MULTIPLE SCLEROSIS, THE VEGETATIVE NERVOUS SYSTEM AND PSYCHANALYTIC RESEARCH. Dr. Smith Ely Jelliffe.

This paper presents an attack on the multiple sclerosis problem from another angle as conditioned by a vasomotor exudative diathesis with a multiple etiology; an experimental research into the unconscious psychologic material and its possible bearing on faulty compensations in the organic field; unconscious action patterns, over compensatory vasomotor responses causing exudations and consequent blocking or interference with nerve pathways; the relationships to other exudative conditions, such as Quincke's edema, catatonic brain swelling, etc.

DISCUSSION

DR. ARCHIBALD CHURCH, Chicago, stated that he could not sufficiently express his appreciation of the philosophic explication that Dr. Jelliffe had so interestingly set forth, but he confessed disappointment that Dr. Jelliffe had not made some reference to recent investigations as to the spirochetal origin of multiple sclerosis and the observations and experiments that had come forward in the last three years. A spirochete had been discovered in the tissues by at least three independent and separately working observers, and inoculations of the spinal fluid in lower animals had been found to produce conditions identical with multiple sclerosis. This spirochete was somewhat similar to the spirochete of syphilis—a single, spiral form or body which terminated at either end in a hairlike terminal, and had been sufficiently definite to have been independently recognized by several observers.

The investigation of the subconscious in these cases was of academic interest, but he hoped that, with Dr. Jelliffe's broad reach into the literature of all lands, the Association might have some information in regard to this alleged definite etiologic factor, and prospective therapy.

DR. WILLIAM A. WHITE, Washington, D. C., said that the remarks of the gentlemen who had previously discussed the paper were the sort of remarks and the reason for which the view propounded by Dr. Jelliffe had been expressed. He had listened with much interest to the paper and was acquainted with Dr. Jelliffe's point of view. He believed that the principles set forth were of immense importance. He also realized that it was exceedingly difficult to have these ideas accepted, as was shown by the discussion of the previous speaker. It was his conviction that the conception as a whole was not a difficult one. It was relatively simple, if it could only be properly expressed.

It seemed to him that it must be conceded that the psyche had a history which was contemporaneous with that of the body, and that the man could not be understood if we limited our conception of him to the period between the time of his birth and the time when he first came under our observation. The individual was connected with his past through the ages by the phylogenetic line of his ancestors and all of those connections must be expressed in him, because the psychologic level of his reactions expresses total reactions.

It seemed to him *a priori* that when there was a serious organic defect in a person, especially one which was phylogenetic in its origin, we must necessarily find, if we know enough to read the signs aright, some explanation of that defect at the symbolic level. That brought up the whole subject of paleopsychology which Dr. Jelliffe had talked about, and the possibility of archaic reactions. If we had an individual whose machinery was archaic, his reactions must be archaic in character. It was only a question of interpretation as to what we believed to be archaic, so that we may be sure that the psychologic symbols were archaic. There might be some question as to whether the symbols that Dr. Jelliffe has set forth were archaic in type, but there could be no question that we had them here, and that their malignancy must depend more or less on their archaic character.

Regarding the infectious origin of multiple sclerosis, he had no doubt that Dr. Jelliffe had that in mind when he spoke of the unity conception—how difficulties of adjustment which grew out of physical imbalances constantly accrued throughout the years until we had certain changes of structure correlated with certain symbols at the psychologic level. Here were organic diseases and there was constant friction, continuous motor sets, which were just the thing that was at the basis of that individual's susceptibility which

permitted certain kinds of infection; so that he could see no antagonism between the infectious relation to the multiple sclerosis of spirochete infection and the point of view which Dr. Jelliffe had set forth. We were dealing with the question of energy transformation and energy discharge, and we saw psychic reactions which must be interpreted. We could then learn whether a man had an archaic machine, or whether he had damaged his machine by too great stress. He spoke for unity of the individual. He did not believe it was possible to have any kind of disease, such as multiple sclerosis, without being able to find some correlative symptom at the psychologic level which fitted into the picture.

Dr. Adolf Meyer, Baltimore, supposed the difficulty of the situation arose largely because one could not help creating a suggestion of etiologic potency of the facts which were brought forth and emphasized. He believed, however, that at the present state of knowledge it was best to look on these things mainly as coexistences; as matters concerning which a sense of economy of the individual would largely determine on what phases one wanted to spend one's time in the individual case. The principle of the economy of science forced us to focus our attention on the things actually demonstrated. One had to determine whether one had either part of a vicious circle, or whether there was possibly an actual initiative rôle. Whether that was the case in the conditions as presented by Dr. Jelliffe, he did not know. He did not think that he had made his case from that point of view and he did not know whether he intended to do so.

He was not sure that Dr. White was not rather maintaining the general doctrine of unity of the organism than any special conviction that we ought to assume that the presentation of Dr. Jelliffe had actually demonstrated that psychogenic factors were potent in multiple sclerosis. He happened to come from one of the centers of multiple sclerosis production. He did not think that it was best at present to say that multiple sclerosis selected persons with archaic type of mind or with anal erotic tendencies, many of which were iniquitous. There is the problem, which had been discussed, concerning the infection of teeth. It was essential that we should be pluralistic, and yet should allow the sense of economy of scientific thought to be rather intent on the question: Does the matter under discussion merely form an incident or possibly part of a vicious circle, or does it have an actual etiologic significance?

Dr. Smith Ely Jelliffe, in closing, said that after Dr. Church had given him credit for erudition, he could ill repay this compliment by confessing ignorance of the whole mass of recent literature concerning the finding of a new spirochete in some patients with multiple sclerosis. Of course, that was an old story. He thought that Dr. Church had probably seen for the last two years in the *Journal of Nervous and Mental Diseases* his abstracts of this work, not only of Kuhn and Steiner's original claims but of Siemerling and others, and vigorous protests concerning the whole subject. In fact, in the May issue of the journal a critical collective abstract and careful discussion of the whole of Kuhn and Steiner's theory was to be found. He thought he had made it perfectly clear that this type of case was outside of this discussion; such types, or any new ones, could be included under the specific infectious types of disseminated cerebrospinal disease. In reply to Dr. Church, he would be discourteous not to acknowledge the validity of his point, but he had already excluded from his discussion that whole group. He did not know how many multiple scleroses might be left after the exclusion of all

similar types of infection. He was not sure that we would have any multiple sclerosis left if we could go sufficiently far into all possible secondary factors. That he did not know, nor could learn from any one else, but he had assumed, on the basis of pathologic findings, that a special group characterized by features belonging to the exudative diatheses was possible. This was the group that interested him in this communication to which he added the findings he had reported.

In answer to Dr. Meyer, he was a thorough believer in the economy of the situation. Naturally, it would be more or less incidental, because should he ask the gentlemen here how many cases they had treated, there would be one, two, six, a dozen or more, excluding records of polyclinic material, so that from the standpoint of time and labor, his contribution to the problem of multiple sclerosis would be more or less incidental. That was not the point in particular, but the whole problem of the exudative diatheses might be entered into. He might enlarge the conception and include the whole group. In that case we might attack catatonic brain swelling, certain arthritides, certain skin exudative phenomena, etc., and many other conditions from a similar point of view. We find in the realm of general medicine groups which have been classified under the exudative diatheses, to the study of which the principles here brought forward might be applied. Here we enter into many problems of physical chemistry, and to his mind a great deal of value might be thrown on these problems by adequate exploration of the unconscious. But to confine his remarks to the present communication, all he contended was that in certain cases of certain conditions called multiple sclerosis, certain things were found in these patients' unconscious. For those who were interested in the probing of the unconscious, deep sea fishing we may call it, it would be interesting and might be important, to learn from others the results of their "soul plankton" findings.

ABDOMINAL NEURASTHENIA. Dr. Alfred S. Taylor. This article will appear in an early issue.

DISCUSSION

Dr. Walter Timme, New York, said that the cases cited by Dr. Taylor were of extreme interest, especially to those who had done work on the abdominal sympathetic. They bore out very well the surgical part of the picture which neurologists had looked for. Some years ago he had done some experimental work on animals along this line. This work was divided into two groups; in one he diminished the vagus activity by ligating the abdominal vagus just before it entered the diaphragm; in the other series he ligated a great many branches of the sympathetic. By these means he produced artificially, respectively, sympathicotonic and vagotonic states. He obtained interesting results in the animals; these results resembled those seen by Dr. Taylor in man. In the animals in which the sympathetic filaments were tied off, the work was done so that only part of the conduction was interfered with. The abdomen was then closed and the animals allowed to live three or four months. In those cases in which the vagus was allowed to be free a condition of general ptosis was found in the abdominal organs, a high degree of motility, lack of tone, a lack of rotundity of the abdominal muscles and malposition of all of them. The animals were killed one and a half hours after the ingestion of food, and the stomach was found practically empty. In those cases in which the vagus was tied off, the stomach and the

large colon were increased in size, and their walls hypertrophied. With this dilatation and hypertrophy there were all manner of kinks in various portions of the ascending colon and the sigmoid, with pronounced enlargement. In those animals there had been retention, that is, six hours after ingestion of a full meal the stomach contents were still in the stomach, there was very little motility, and conditions were obtained much like those Dr. Taylor found in man.

With these disturbances in the vagus and sympathetic in man, there are certain vasomotor and blood pressure alterations which are allied to fatigability, low carbon dioxid tension and blood sugar disturbances; and there is a condition which has been dubbed by many as "abdominal neurasthenia."

The condition which was produced artificially by ligating is frequently caused by various procedures, that is, any torsion of the diaphragm in malposition may cause torsion and pinching of the vagus, and may produce the same symptoms that were brought about artificially. Second, toxins affecting the suprarenal glands may do almost as much toward blocking the sympathetic, and there results a train of symptoms referable to the suprarenals plus the gastro-enterologic findings.

If that condition is seen early enough, that is, before the adhesions due to ptoses are formed, a great deal can be done therapeutically. After the adhesions are formed, we must proceed surgically, and relieve the conditions produced by the kinks and adhesive bands. If it is realized that these conditions of pain, hyperacidity, vomiting, loss of weight, general depression and fatigability may be produced by such an actual terminal local condition as that described by Dr. Taylor, we are in a fair way toward relieving many of the patients that create a great deal of disturbance in our life. They are referred to us usually with a letter something like this: "The patient whom I am sending you with this note is a young lady who for the past four years has had vomiting with attacks of pain. She has had three operations. We removed her appendix and her gallbladder, and then we took out her ovaries and uterus, and now the poor girl has nothing left—not even hope. Please help us out." These cases are becoming more frequent, but because many surgeons recognize the true situation, we now frequently see them before operation is necessary.

Dr. Timme thought that Dr. Taylor's work should be noted and that further work in this field would be productive of much good.

Dr. Smith Ely Jelliffe, New York, said that Dr. Timme's narration of his patient reminded him of approximately 50 per cent. of his own. They came to him with no ovaries, no teeth, no intestines, no hope, no pocketbook, no anything—and then he was expected to put them on their feet. He did not always do it, naturally; but, working along the lines that Dr. Timme had already indicated, that is, with the concepts of the physiology of the vegetative nervous system and with the belief, which he did not mention but which he knew he sustained, that emotions may act exactly like toxins, he had cured some of the people who did not have anything left inside of them after the surgeons had tried to cut disease out of the body.

Dr. Alfred S. Taylor, in closing, said the essential point of the paper was that these patients had been suffering from the effects of organic anomalies that would prevent therapeutic treatment, in the way of internal medicine, from working satisfactorily. There was a mechanical blocking of partial degree in every one of them, obvious in the roentgen-ray examination and confirmed on the operating table. The correction of these mechanical diffi-

culties resulted, without other treatment, in an entire clearing up of the various nervous disorders, together with the digestive disturbances.

He knew it was unpopular to refer to intestinal toxemia and similar states of the intestinal tract, and appreciated how many ills had been laid at its door without good reason. However, if there were any blocking, even if not complete, if there were slight disturbances of the digestive processes every minute of the twenty-four hours, it was easy to believe that they influenced the nervous system deleteriously, and that if corrected, the disturbances, both of digestion and of the nervous system, would disappear.

The only conclusion he would like to draw from the presentation of these cases was not that one can cure every case of neurasthenia with these procedures, but that in treating a case of neurasthenia with abdominal symptoms it was only fair to the patient to make a roentgen-ray examination of his digestive tract to find out wheher there was something organic that might be corrected, and then to be guided by the findings.

THE SIGNIFICANCE OF PAIN IN THE FACE IN DETERMINING THE LOCATION. Dr. Williams B. Cadwalader. This article appeared in the August issue, page 182.

DISCUSSION

Dr. Malcolm A. Bliss, St. Louis, said that it might be of interest in this type of case to recite one that occurred recently in his experience. A woman about 50 years old was sent to him for a fifth nerve disorder—for tic. The striking fact was that pain in the face extended over the distribution of the first and second division. She kept her jaws rather tightly closed, apparently because it gave her intense pain to open them. On investigation it was found that by digging deep behind the ramus of the jaw on that side there could be felt a mass that had extended across the base of the skull in such a way as to involve, outside of the skull, the first and second divisions of the fifth nerve.

Dr. Harvey Cushing, Boston, said that he could subscribe fully to all that Dr. Cadwalader had said. He had had a series of forty-five verified acoustic tumors, and he thought that the chronology of the symptoms was the most important means of making a diagnosis. Sometimes the patients are not intelligent enough possibly to appreciate the exact order of the onset of the symptoms, but in nine out of ten cases, on questioning them, they will recall that the tinnitus and the oncoming deafness preceded the symptoms that point to cerebellopontile involvement or those that indicate general evidence of headache and choked disk. Sometimes the interval is very long. He had now a young man in the hospital who, seventeen years ago, had a sudden attack of deafness and then no further symptoms until he began to have headaches, choked disk and evidences of cerebellar involvement. He proved to have an acoustic tumor.

The trigeminal tumors are much more rare, and they begin in the way Dr. Cadwalader mentioned—with pain in the face—and they tend, in their slow growth, to spread posteriorly and to get into the posterior fossa, so that deafness, and possibly facial paralysis, may come at any time. They, too, are slow growing lesions, and although it is a difficult procedure, the sensory root division in these cases gives a great degree of relief, and the patients may go on in comfort for a number of years. Thus, a long period of symptomatic relief may be assured, although the procedure is purely symptomatic and palliative.

Dr. Williams B. Cadwalader, in closing, said he was in accord with all that Dr. Cushing had said, but wished to emphasize the importance of ascertaining the

exact order in which these symptoms developed. If pain begins early, it may indicate that the tumor is growing in the region of the gasserian ganglion. On the other hand, if deafness begins first it may mean an acoustic tumor growing in the cerebellopontile angle.

SECTION TOTALE DE LA MOELLE DORSALE PAR CONTUSION RACHIDIENNE AVEC CONSERVATION DES REFLEXES ROTULIEN ET ACHILLEEN GAUCHES ET PRESENCE DE REFLEXES D'AUTOMATISME MEDULLAIRE (COMPLETE SECTION OF THE DORSAL SPINAL CORD THROUGH SPINAL CONTUSION WITH PRESERVATION OF THE LEFT PATELLAR AND ACHILLES' REFLEXES AND THE PRESENCE OF REFLEXES OF MEDULLARY AUTOMATISM).

Dr. Gustave Roussy, Paris, France (by invitation).

The patient suffered from total interruption of the spinal cord as a result of a contusion. He was observed by Dr. Roussy eighteen months after this injury. At this time the clinical examination revealed the following condition: There was a total flaccid paraplegia with loss of both superficial and deep sensation up to the tenth thoracic segment; there was conservation of the left knee jerk occasionally accompanied by knee clonus, likewise conservation of the left tendo Achillis jerk; in addition, there were present the so-called reflexes of medullary automatism which could be induced on either side by irritation of the cutaneous surface by pressure exerted on the malleolar region and likewise by the so-called Pierre Marie-Foix procedure. A fact of importance in this case was that some of the reflexes of medullary automatism could be provoked likewise by injecting into the cystostomy opening fluids for irrigating the bladder, a bilateral mass reflex occurring not only when the fluid was introduced, but also when there was any change in its temperature or pressure. Finally, there was observed in this case, aside from the sphincter, genital, vasomotor and pilomotor disturbances, which were marked, a most pronounced hyperhidrosis.

Anatomically, there was complete disappearance of all medullary tissue on a length of 1.5 cm.

Histologically, it was proved beyond doubt by all staining methods, and particularly by the Bielschowsky method, that there was no medullary substance left at the level of the lesion. In the meninges, located on the anterior surface, a number of root bundles were discovered that contained regenerating fibers.

The hypothesis was advanced by Dr. Roussy that it is more logical to suppose that the inferior segment has progressively recovered its function of medullary automatism, which became manifest through the reappearance of some of the tendon reflexes, as well as by the presence of the so-called reflexes of defense. The lapse of time has to be remembered, the fact that the patient was observed, as was said before, eighteen months after the initial lesion. In terminating, the point was emphasized that the observations recorded during the war served to approximate more closely the results of clinical investigation and the facts already demonstrated in the domain of experimental physiology, and that we can in a certain measure speak of spinal man in the same way that we speak of spinal dog.

DISCUSSION

Dr. Peter Bassoe, Chicago, asked Dr. Roussy in regard to the plantar reflex in this case, if its condition would possibly have some bearing on the problem of the nature of the Babinski sign.

If he was not mistaken it had been found that in total section, with subsequent return of the tendon reflexes, the Babinski sign has not been obtained. He was told by men who were in the war zone that its appearance after injury of the cords with paraplegia was looked on with favor as indicating that a total lesion did not exist. If a Babinski sign should be obtained in a case of proved total section, it would show that no cerebral component is necessary, and that the extensor response may only be part of a mass reflex.

Dr. Williams B. Cadwalader, Philadelphia, said that the subject that Dr. Roussy had brought up was very interesting, particularly after some of the experiences in France during the war.

Many will remember the report of a case, in 1901, by Dr. Stewart of Philadelphia in which there had been a gunshot wound with complete section of the spinal cord at the level of the tenth dorsal segment. Operation was performed by Dr. Stewart and the spinal cord was reunited by sutures. Subsequently it was claimed that return of function had occurred. Dr. Weir Mitchell expressed his skepticism as to this result at a meeting of this Association held at that time. He had known the patient well and had observed her more or less during these years; had examined her carefully, and had just prepared a report (published in the *Annals of Surgery*, June, 1920) of her present condition. There can be no doubt, so far as the clinical signs are concerned, that she still has complete division of the spinal cord with no return of function. The case presents all the automatic reflex movements which have just been so carefully described by Dr. Roussy. The picture presented is like that described by Head and Riddoch of England, but is slightly modified. The limbs are spastic; there is a permanent Babinski sign—in fact, a typical "mass reflex"—and no return of function, in spite of the fact that nineteen years have elapsed since the spinal cord was reunited.

Dr. Harvey Cushing, Boston, said that many years ago—in 1900, he believed—he had a patient with a traumatic total transverse lesion of the cord, as was supposed. He was well taken care of and had a return of all the deep reflexes. The case was thoroughly studied and innumerable sections made of all the spinal segments. As far as could be found, there were no fibers passing through the seat of the lesion. He had expected to find some fibers because he had been imbued with Bastian's theory of complete flaccid paralysis after total transverse lesions.

He had had the opportunity of seeing such cases with Drs. Head and River, and the extraordinary mass reflexes they have described are interesting. They, of course, account for the cases that have been spoken of, in which there has been a return of function after suture of the cord. The one thing he wanted particularly to mention was his surprise that in this patient of Dr. Roussy's so long an interval had elapsed before the reflexes returned, because in Head's cases these automatic reflexes began to return quite early, sometimes in two or three weeks. As he understood it, too, it is because in these cases there have been no bed sores or infection, and he believed that it is only in the absence of infection that the cells of the distal portion of the cord succeed in regaining their function. If bed sores, cystitis and renal infection occur, the resultant toxins appear to prevent the cells from regaining their function, so that a total transverse lesion may continue to have the picture we formerly associated with it.

In this early study which he made twenty years ago, he felt a few fibers might possibly have been overlooked in the scar. He asked Dr. Head about

this, and he admitted that a few fibers might possibly have been preserved in the cases he was studying. They are difficult to detect even on careful post-mortem histologic studies.

However, some four or five years ago he treated a poor woman with a metastatic carcinoma in the lower thoracic spine, symptoms of which appeared some twenty years after amputation of the breast—one of the late cases. She suffered greatly from pain and spasmodic contraction of the legs. She continued in fairly good health, though praying for death as a release from her suffering. He should possibly have made a partial division of the tracts in the cord, as suggested by Drs. Spiller and Frazier, but instead he deliberately divided the cord completely four or five segments above the situation of the lesion. It is a simple and dry procedure. This woman, who had been taken care of in the hospital, was exposed to none of the accidents of the soldier, who had to be transported and was likely to get bed sores and infection. Here, then, was a case of unquestioned complete surgical transsection of the cord. The patient had an early return of these mass reflexes, like those Dr. Roussy so clearly told about. She lived in great comfort for several months, free from pain.

Dr. Hugh T. Patrick, Chicago, asked Dr. Roussy how he explained the return of the knee jerk and Achilles' jerk on the left side and not on the right; unless, of course, the lesion was lower on the right side, which he had not understood to be the case.

Dr. Gustave Roussy, in closing, replied to Dr. Bassoe that at no time was the Babinski phenomenon, or its normal plantar reflex, demonstrable.

Regarding the point brought up by Dr. Cushing as to the period of time which elapsed before the return of the tendon reflexes, nothing definite could be stated as the patient did not come under his observation until eighteen months after the injury, and only fragmentary information was obtained concerning his condition prior to that time.

In answer to Dr. Patrick, no plausible explanation could be given for the fact that the tendon reflexes reappeared on the left side only. The reflexes of defense, however, occurred on both sides.

Book Review

MANUAL OF PSYCHIATRY. By Aaron J. Rosanoff, M.D. Fifth Edition. Pp. 624. New York: John Wiley & Sons, Inc., 1920.

Psychiatry moves. Editions are milestones. In the first edition (1905) of this manual, the practice of psychiatry was dealt with in one chapter: it now fills ten. New descriptions of mental measurements appear, psychanalysis, community surveys, social service, after-care.

The de Fursac translation, much revised, is still the center of Parts I and II, but there are many explanations and interpolations by Rosanoff, Hollingworth, Neymann and Miss Jarrett. There is a tendency to turn from the general to the particular. The result is a book, patchy but clear, in which the reader can easily find his way. Part III (200 pages) contains detailed instructions for performing intelligence tests, examinations of spinal fluid and special diagnostic procedures which will gratify the physician who needs a very definite help in an unfamiliar field.

The psychiatrist will wonder at the dispassionate expositions of psychoses and treatments from irreconcilable points of view. The older psychotherapy is on one page and psychanalysis on another. But why not?